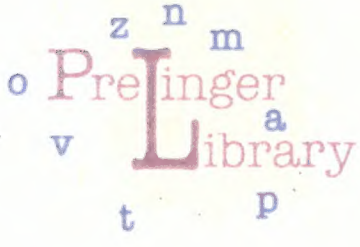
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DISCARD

ELECTRIC RAILWAY JOURNAL

McGraw-Hill Publishing Company, Inc. SEPTEMBER, 1930 Thirty-five Cents per Copy

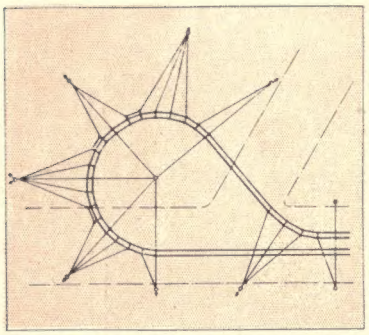


Twin Coach
BY F.R.FAGEOL KENT, OHIO

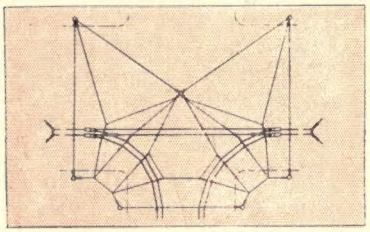
Because this unit is developed from genuine motor coach materials and possesses the same circulating load arrangement as the Big Twin—operators are willing to pay more for it than others of like capacity.

WESTINGHOUSE—A PIONEER AND LEADER IN TROLLEY BUS APPLICATION

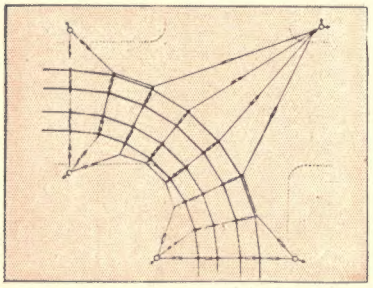
How the Overhead Serves the Trolley Bus



A loop such as would be made around a city block or at the end of the line where the turning radius is small.



Wye construction such as would be used at the end of the line.



Typical double line curve construction on a 90-degree turn.

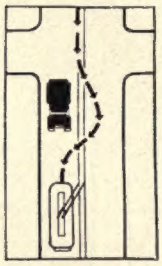


Westinghouse furnishes complete electrical equipment for trolley buses, including overhead and current collecting equipment.

THE trolley bus has become an important unit of railway transportation, and to operate efficiently, the overhead equipment must be dependable.

The illustrations of loop, wye, and curve types of overhead construction, as shown, represent the most modern practice for trolley bus operation.

Westinghouse engineers gladly will study your problems and submit specific recommendations.



Weaving in and out from the curb, dodging slow street traffic, the Trolley Bus proves its value in keeping fast, accurate schedules and satisfied patrons.

Service, prompt and efficient, by a coast-to-coast chain of well-equipped shops

Westinghouse

T 31455

TUNE IN THE WESTINGHOUSE SALUTE OVER THE N. B. C. NATION-WIDE NETWORK EVERY TUESDAY EVENING.

Electric Railway Journal

Consolidation of
Street Railway Journal and Electric Railway Review

JOHN A. MILLER, JR., *Editor*

Vol. 74, No. 10 — *Pages 555-610*

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GEORGE J. MACMURRAY
CLIFFORD A. FAUST
J. W. MCCLOY
JOSEPH R. STAUFFER

PAUL WOOTON, Washington
W. C. HESTON, Pacific Coast Editor
ALEX MCCALLUM, London, England

LOUIS F. STOLL, Publishing Director

It's Warm Now

But winter with its snow and ice will soon be here.

Which is a reminder that snow fighting equipment and practices should receive careful scrutiny very shortly.

Read the comprehensive article to appear soon, analyzing the snow-removal methods of several large properties, and then prepare for

Ol' Man Winter!

McGraw-Hill Publishing Company, Inc.

Tenth Avenue at 36th Street
New York, N. Y.

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1930

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LOS ANGELES, *632 Chamber of Commerce Bldg.*
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Contents of This Issue

SEPTEMBER, 1930

Copyright, 1930, by McGraw-Hill Publishing Company, Inc.

Editorials 555

Mobile Bids for Patronage 558
By CLIFFORD A. FAUST

New Braking Apparatus Demonstrated 562

Operating Statistics Prove Success of Trolley Buses in Chicago 563
By F. A. FORTY

Modern Design Features Windsor Cars 565

Utility Valuation Demands Logical Treatment 567
By JOHN W. BURKE

Combination Traffic and Warning Signal Used at Salt Lake City 571

Articulated Cars Tested in Dresden 572

Selection of Motor Controls Depends on Circumstances 575
By R. S. BEERS

Aluminum Frame Reduces Railway Motor Weight 476

Montreal Tramways Installs Third Automatic Rectifier Substation 477
By M. L. DE ANGELIS

Cleveland Railway Has Contributory Pension Plan 581

Surrounding Men with Conveniences 583
By H. W. MCCARTY

Instruction School for Linemen 586
By ANGUS SCOTT

Maintenance Notes:

Loosening Tight Wires in Conduit—*By R. S. McIntosh*... 587

Exhaust Gas Fumes Discharged from Roof of Bus..... 587

Bus Hood Clamp Locks Easily —*By L. Rose*..... 588

Simple Cradle for Storing Armatures 588

Warning Signal Insures Proper Meshing of Gears—*By E. von Pirch* 588

Steel Plate Safety Shoes Fitted to Ladder—*By Terance Scullin* 589

Gage to Check Alignment of Commutators—*By J. S. Dean* 589

Storage of Lamps During Car Overhaul—*By C. B. Hall*.. 589

Grease Ring Protects Commutators on Ball-Bearing Motors—*By H. J. Beadle*... 590

Slide Valve Grinder—*By C. W. Wood* 590

Track Sand Stored by Compressed Air—*By W. S. Yeates* 590

Leveling Bar Facilitates Joint Alignment—*By William Anthony* 591

Old Rail Makes Satisfactory Whistle Post—*By Joseph M. Hysan* 591

Marking Wood Poles for Identification 591

Spraying Destination Signs at Kansas City 592

Increasing Truck-Jaw Life—*By J. Mondoux* 592

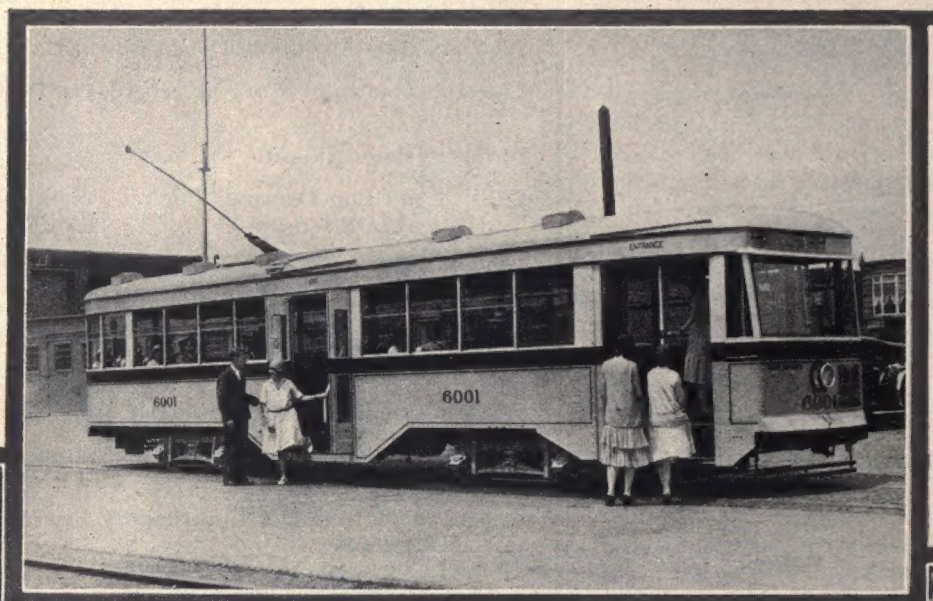
New Products for the Railways' Use 593

Monthly and Other Financial Reports 595

News of the Industry 597

Parkersburg
Allegheny Valley
Youngstown
• • • • BALTIMORE





One of Baltimore's Modern New Street Cars Equipped with Westinghouse Motors and VA Control.



One of the New Westinghouse-equipped Cars on Baltimore Street.



Light Street, with a New Westinghouse-equipped Car in the Foreground.



AFTER a careful study of the operation of Westinghouse high-speed motors and WN drive in Parkersburg, Allegheny Valley and Youngstown, the progressive management of the United Railways and Electric Company of Baltimore has specified Westinghouse 50-hp., high-speed motors, WN drive and VA control for 30 new city cars. The following advantages are among those responsible for the selection of this equipment:

1. A saving of 4260 pounds weight over a similar type of car equipped with single reduction motors.
2. Smooth and rapid acceleration with VA control, regardless of load.
3. Quiet and smooth operation, due to spring-mounted motors and totally enclosed gears running in a bath of oil.
4. Variable rates of acceleration easily and quickly provided with VA control.
5. Oil and waste lubrication completely eliminated.

These new cars will demonstrate to the riding public of Baltimore the advantages of modern cars and equipment.

The United Railways and Electric Company of Baltimore also are placing in operation fifty modern cars equipped with Westinghouse light-weight Type 516, 50-hp. motors and VA control.

Mt. Vernon Place, Baltimore, Showing Washington Monument.



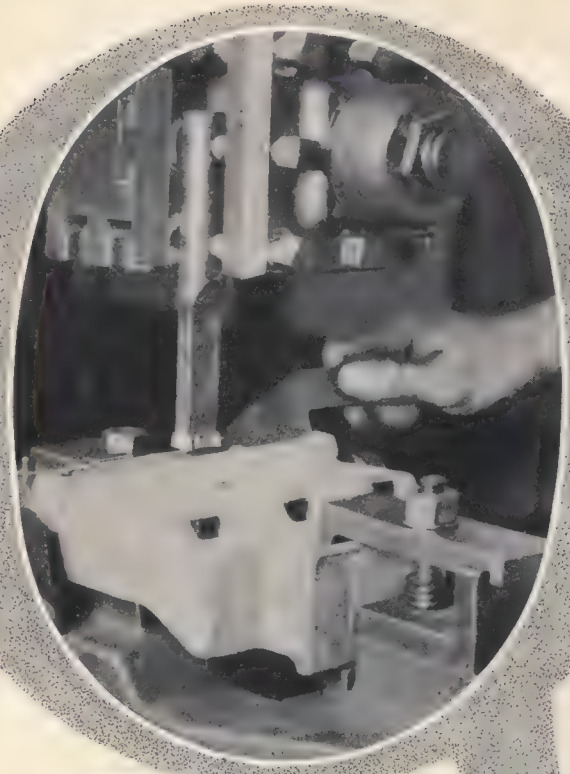
Service, prompt and efficient, by a coast-to-coast chain of well-equipped shops

Westinghouse

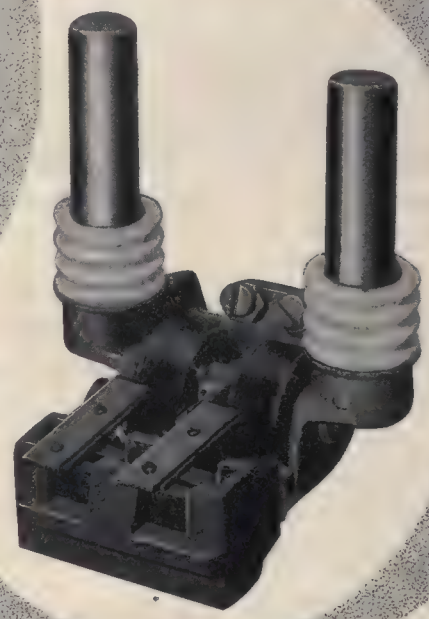
T 31509

TUNE IN THE WESTINGHOUSE SALUTE OVER THE N. B. C. NATION-WIDE NETWORK EVERY TUESDAY EVENING.

QUANTITY *production* makes QUALITY *practical*



MACHINING BRUSH-BOX IN BRUSHHOLDER



COMPLETE DETACHABLE BOX TYPE BRUSHHOLDER

Maximum *use of* Tools *permits Manufacturing Economies*

WESTINGHOUSE produces renewal parts for the users of every class of its apparatus all over the world. This extensive field affords an opportunity to manufacture in quantity, thus permitting the maximum use of tools and efficient shop equipment. The savings effected by this Quantity production are offered to the customer in the form of maximum Quality at economical prices.

Service, prompt and efficient, by a coast-to-coast chain of well-equipped shops

Westinghouse

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TUNE IN THE WESTINGHOUSE SALUTE OVER THE N. B. C. NATION-WIDE NETWORK EVERY TUESDAY EVENING.



YOUNGSTOWN

• (Coffin Award)



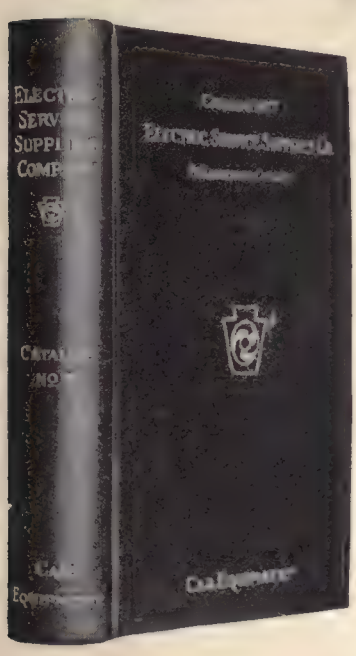
DES MOINES



BALTIMORE

Photos courtesy of J. G. Brill Co.

NEW CARS *Keystone Equipped*



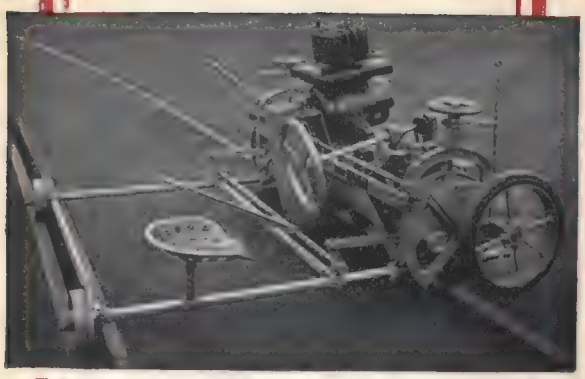
Always refer to our catalog No. 7 when planning new cars or rebuilding old ones. If you do not have a copy, please ask for it.

These operators have selected numerous items of equipment from the Keystone line. They will profit greatly by the greater efficiency and added attractiveness which this equipment assures.

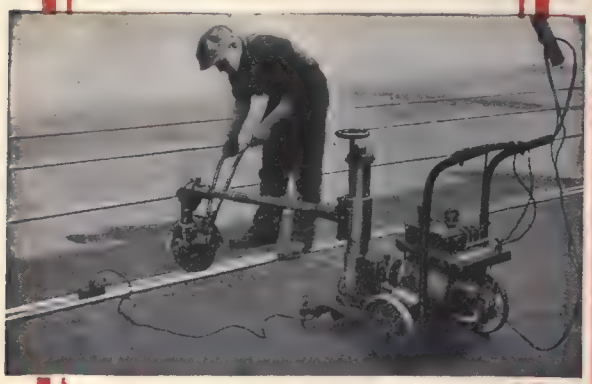
ELECTRIC SERVICE SUPPLIES CO. Manufacturer

RAILWAY, POWER AND INDUSTRIAL ELECTRICAL MATERIAL

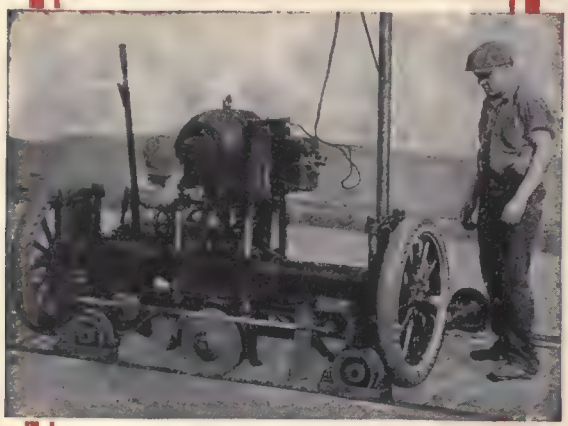
Home office and plant at 17th and Cambria Sts., PHILADELPHIA; District Offices at 111 N. Canal St., CHICAGO; 50 Church St., NEW YORK; Bessemer Bldg., Pittsburgh; 88 Broad St., Boston; General Motors Bldg., Detroit; 316 N. Washington Ave., Scranton; Canadian Agents, Lyman Tube and Supply Company, Ltd., Montreal, Toronto, Vancouver, Winnipeg.



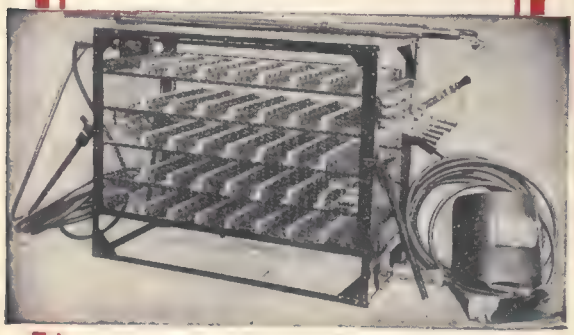
Improved Atlas Rail Grinder



Eureka Radial Rail Grinder



Imperial Track Grinder



Ajax Electric Arc Welder

Incompatibles: Low rail joints and Low car maintenance

Good cars don't stay good long on rough track. On good track, even old cars cost less to run and maintain.

New or old, cars don't build good-will or traffic if you give your passengers a rough ride.

In the mind of to-day's public a rough ride is a rough deal.

Smooth the rail and you smooth the public temper.

Build up low joints and you build up traffic.

Eradicate corrugations and you eliminate a source of complaint.

These jobs, like life itself, are largely a constant grind. Here are the grinders—plus their able assistant, the electric arc welder.

Railway Track-work Co.

3132-48 East Thompson Street, Philadelphia

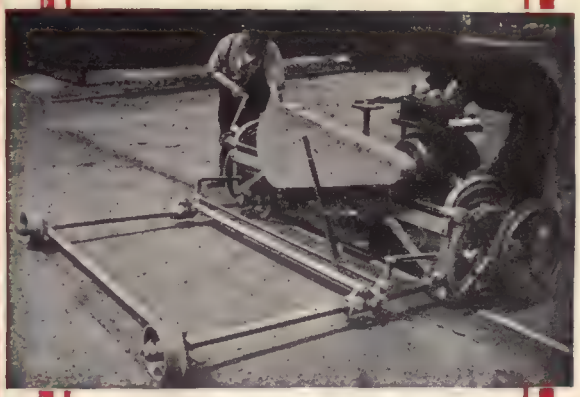
AGENTS

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Chas. N. Wood Co., Boston
H. F. McDermott, 208 S. LaSalle St., Chicago
F. F. Bodler, San Francisco, Cal.
H. E. Burns Co., Pittsburgh, Pa.
Equipment & Engineering Co., London

3572



Reciprocating Track Grinder



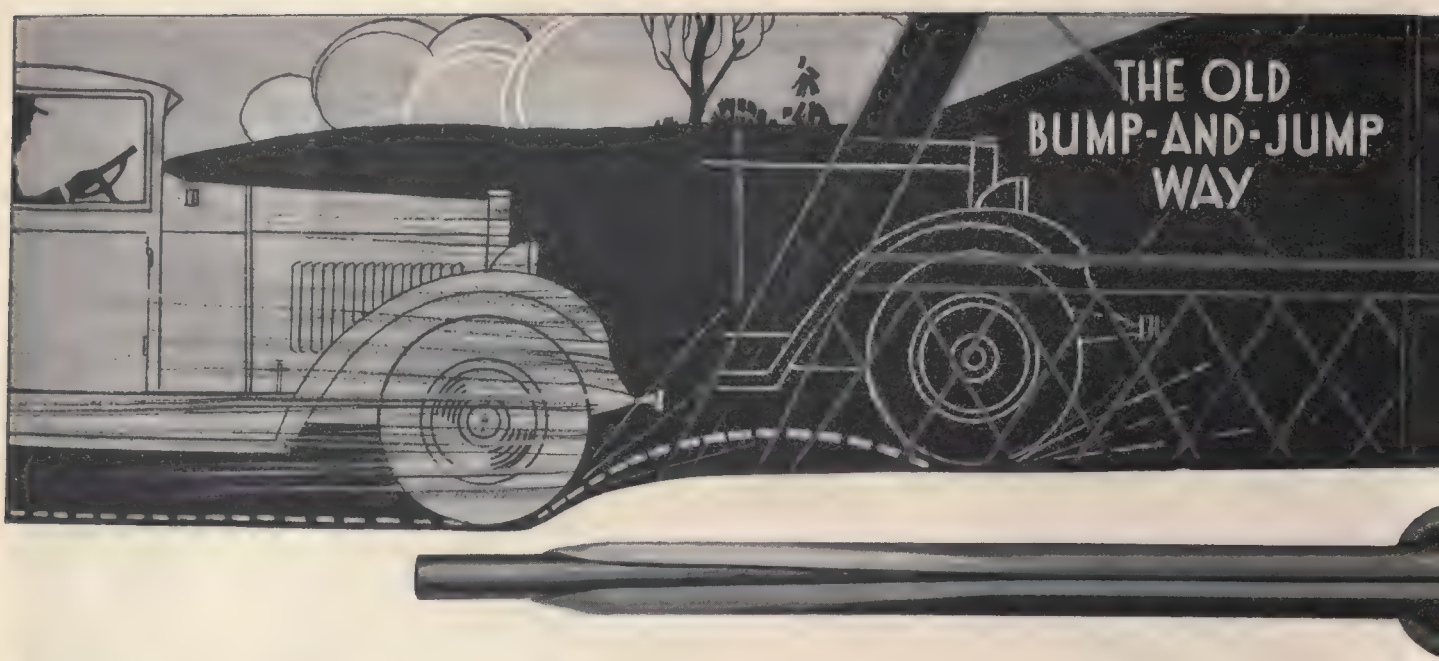
Vulcan Rail Grinder



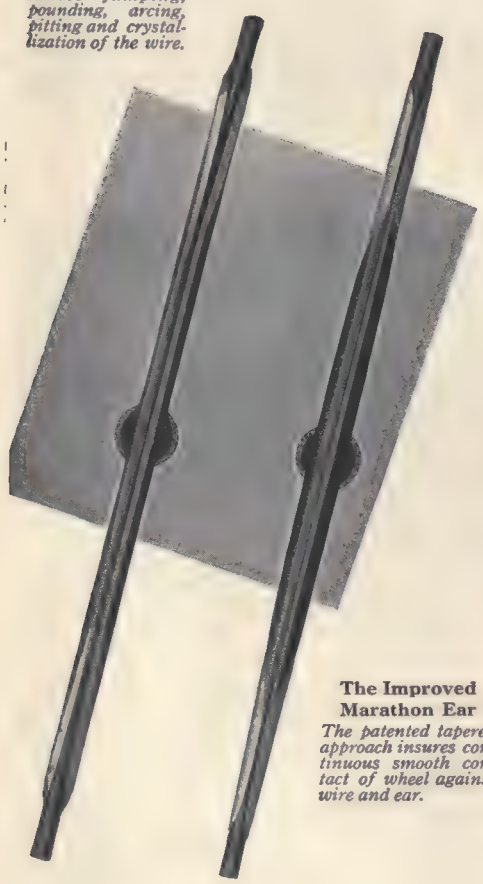
Reciprocating Grinder Car, showing one of the grinding units.



RTW Curve Oiler



The Old Type Marathon Ear
Abrupt approach causes jumping, pounding, arcing, pitting and crystallization of the wire.



The Improved Marathon Ear
The patented tapered approach insures continuous smooth contact of wheel against wire and ear.

The refinements of the ***Improved*** *Marathon Ear (patented) are readily recognized in this comparison with the old. The gradual taper of the approach and leave from the wire to the boss section insures smooth wheel passage.*

THE OLD STYLE MARATHON EAR

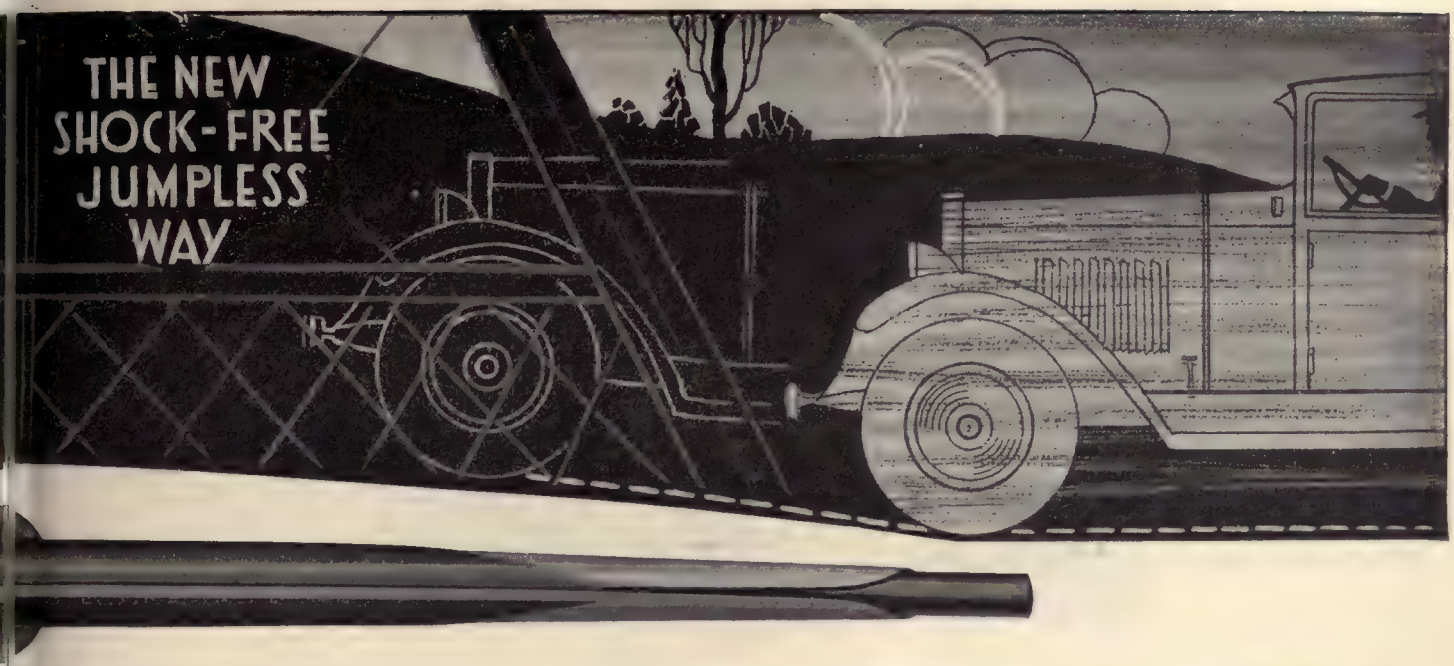


WHAT a difference a graded approach makes! Formerly, the wheels would hit the end of the bridge, bound into the air, and bounce along for several feet. Then, when leaving, they would drop off the bridge to the road level and bounce along for several feet more before settling down.

But now, it's different! The bridge has been improved. The approaches have been graded; the two end humps have been ironed out; and the passage is smooth. Hit 'er at sixty, if you like, and the wheels won't bounce. Just one smooth, quick surge and the bridge is left behind.

That's the difference between the older type ears with their abrupt approach and leave, as contrasted with the new and *improved* Marathon Ear, with its long, gradual, tapered approach and leave.

The *improved* Marathon Ear is tapered, not by coarse grinding—which has a tendency to burn and crystallize



THE NEW *IMPROVED* MARATHON EAR



the metal—but by special milling equipment that insures smoothness and precision.

By tapering and lengthening the approach, it has been possible to thicken the lips at the center section, the point of greatest wear. This makes no appreciable difference in the peening qualities but adds materially to the service life of the ear.

When the old type Marathon Ear was introduced six years ago, it doubled and tripled the number of car passes obtainable from trolley ears of the earlier type. On this record, the *improved* Marathon Ear, which will render still greater service, and better protection to the trolley wire, merits immediate investigation.

Ohio Brass Company, Mansfield, Ohio
Canadian Ohio Brass Co., Limited
Niagara Falls, Canada
1293L

Ohio Brass Co.

NEW YORK PHILADELPHIA PITTSBURGH BOSTON CHICAGO CLEVELAND ST LOUIS ATLANTA DALLAS LOS ANGELES SAN FRANCISCO SEATTLE

PORCELAIN INSULATORS
LINE MATERIALS
RAIL BONDS
CAR EQUIPMENT
MINING MATERIALS
VALVES



O-B Traction News
is issued monthly to electric railway men. The next issue will contain a complete description of the new and improved Marathon Ear.
If you are not now receiving a copy, we will be glad to send this publication regularly, upon request. The coupon is for your convenience.

Ohio Brass Co., Mansfield, Ohio

Please put my name on your mailing list to receive O-B Traction News regularly.

Or, the member of our organization whose name appears below will be interested in receiving O-B Traction News regularly.

Company Name .....

Individual .....

Title .....

Complete Post-

al Address .....



The Success of Manganese Steel Welding Depends Almost Entirely Upon the Quality of the Welding Rod Used

IRRESPECTIVE of your past experiences you will be most agreeably surprised at the results obtained by welding up your manganese steel castings with STOODY MANGANESE WELDING ROD.

STOODY MANGANESE WELDING ROD flows on remarkably easily and forms a smooth deposit which, in the majority of instances, requires little, if any grinding.

Why not let us tell you of the many accomplishments of this newest aid to railway maintenance? Undoubtedly there is a user of STOODY MANGANESE ROD in your vicinity.

STOODY COMPANY

Manufacturers of

Welding Rod ◆ Alloy Steels ◆ Equipment

WHITTIER, CALIFORNIA



13 *New Cars* for Youngstown

Equipped with "NP" Door Control

These cars were placed in service April 1, 1930 ..... They have a seating capacity of 45 passengers ..... Low steps make them easy to board ..... Schedule speeds have been increased substantially and they have succeeded in pleasing the public ..... They embody the latest design of operating equipment including NATIONAL PNEUMATIC DOOR CONTROL.

NP

NATIONAL PNEUMATIC CO.

THESE SEATS CAN FLATTEN THE LOAD CURVE



A LARGE part of the evening rush-hour traffic is composed of women shoppers. They are tired, and sitting on a hard car seat is little better than hanging on a strap.

We suggest that the afternoon load can be spread into earlier hours by advertising the advantages of a comfortable, restful ride home in uncrowded cars equipped with luxurious seats. There is a definite, sensible, comforting appeal to the woman shopper in this suggestion. She will gladly accept it. And when she finds deeply-upholstered, restful, back-supporting seats that deliver her at her corner refreshed by the ride, she will make early home-going her regular practice.

The first step is to equip all cars, new and old, with Hale & Kilburn luxury seats. We shall be glad to discuss this with you.



These new Osgood Bradley cars are equipped with Hale & Kilburn No. 909 seats and the Brooklyn and Queens surface lines find that they are very popular with passengers.

HALE & KILBURN SEATS

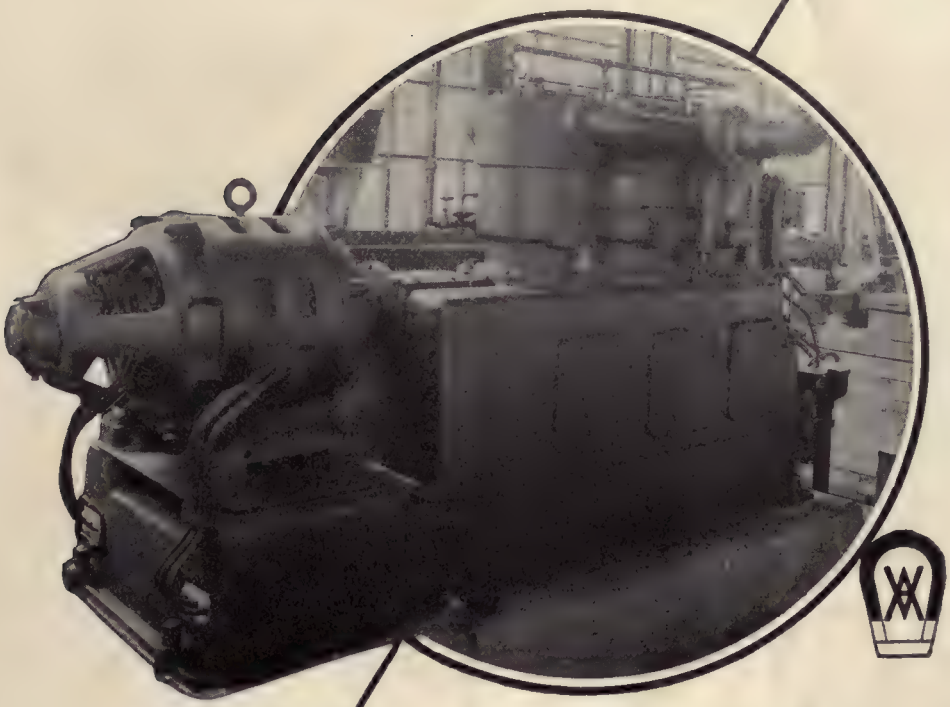
HALE & KILBURN CO.

General Offices and Works: 1800 Lehigh Ave., Philadelphia

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Frank F. Bodler, 903 Monadnock Bldg., San Francisco
W. L. Jefferies, Jr., Mutual Bldg., Richmond
W. D. Jenkins, Praetorian Bldg., Dallas, Texas
H. M. Euler, 53 First St., Portland, Oregon

WESTINGHOUSE—NATIONAL *Air Compressors*



POWER HOUSE

CAR BARN

SHOP

WHEREVER there is a need for compressed air on street railway properties, Westinghouse-National compressors can and are being used. For every requirement — in power house, car barn, shop, or on the right of way—there is a suitable type and size available (ranging from 2½ to 700 cu. ft. displacement).

When you think compressed air for any purpose, think Westinghouse-National!

WESTINGHOUSE TRACTION BRAKE CO.

General Office and Works: Wilmerding, Pa.

"QUALITY MACHINES FOR QUALITY SERVICE"



CONTROL

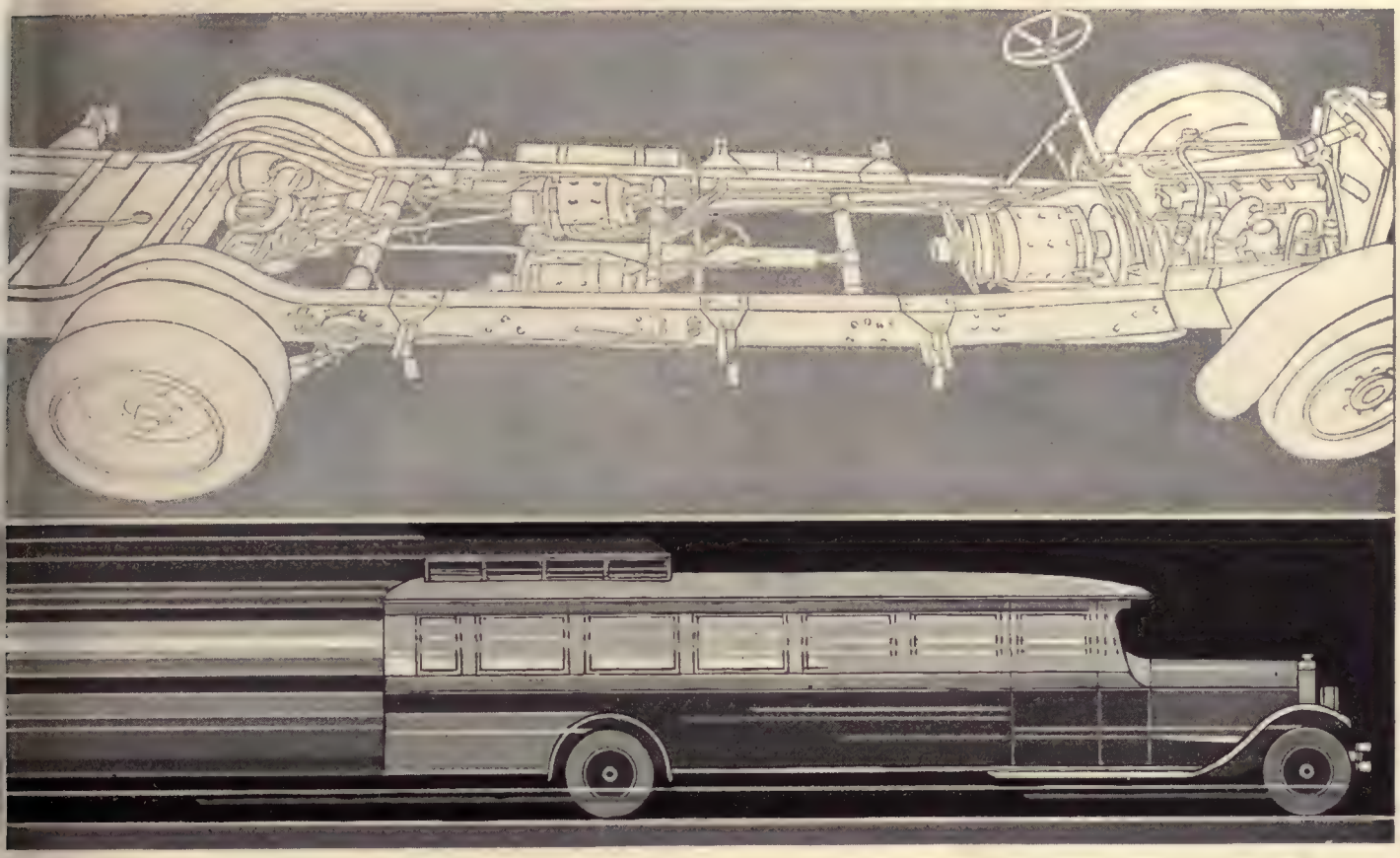




ELECTRIC DRIVE
for
GAS-ELECTRIC BUSES
and
DELIVERY TRUCKS

GENERAL

SIMPLE · SMOOTH · SILENT

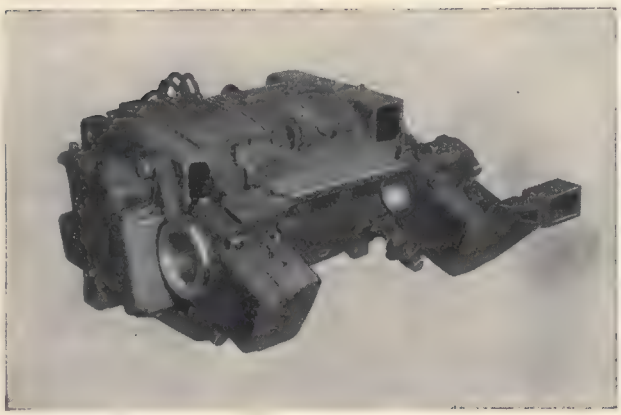


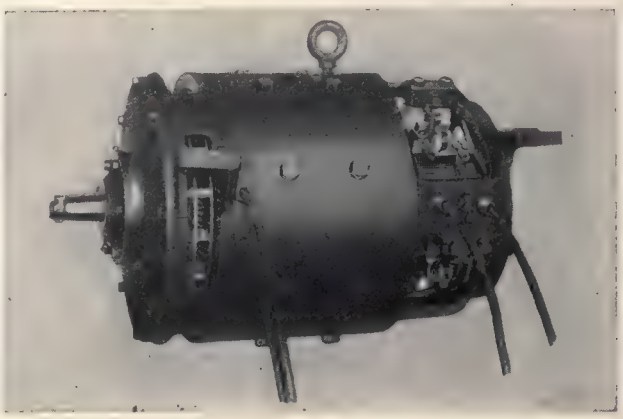
TO-DAY, both the automotive industry and the public are enthusiastic in praise of "silent gears" and four-speed transmissions. But not one of the various designs provides the inherent simplicity, smoothness, and silence of control that gas-electric drive has made available to every bus operator. What is more, these features alone were never sufficient to win a place for the 2,000 gas-electric-drive buses now on the road. Economy of operation and the ability to increase schedule speeds have always been foremost among the advantages of the gas-electric. For complete information, address the G-E sales office nearest you or General Electric Company, Schenectady, N. Y.

390-59

ELECTRIC

2 NEW MOTORS . . . . . FOR THE ACCELERATION OF ELECTRIC TRANSPORTATION





THE NEW GE-702
600-VOLT, 35-HORSEPOWER

Fast acceleration with low maintenance — that characterizes the performance of this new G-E motor, designed to meet every requirement of the modern light-weight car. Excellent commutation under all conditions is obtained through the use of four commutating-field poles and bolted-type commutator construction. The ventilation is from pinion end toward commutator, the gear case acting as a baffle to prevent the entrance of dirt and moisture. In addition, this motor is equipped with G-E constant-oil-level bearings — an important feature in the reduction of maintenance costs.

THE NEW GE-1154
600-VOLT, 50-HORSEPOWER

The GE-1154 is a new automotive-type motor designed especially for trolley-bus application. It provides maximum horsepower for a given weight. The rolled-steel frame has an outside diameter of but slightly more than 16 1/2 inches. Such features as trailing brush-holders, grease-sealed, annular ball bearings, bolted-type commutator construction, and well-designed ventilation contribute to the quiet, dependable performance of this new motor. The high quality of General Electric equipment is represented in every detail of design and construction.

Should you desire additional information concerning these new General Electric motors, address your nearest G-E office or General Electric Company, Schenectady, N. Y.

330-152

JOIN US IN THE GENERAL ELECTRIC PROGRAM, BROADCAST EVERY SATURDAY EVENING ON A NATION-WIDE N.B.C. NETWORK

GENERAL ELECTRIC

SALES AND ENGINEERING SERVICE IN PRINCIPAL CITIES

Electric Railway Journal

Consolidation of
Street Railway Journal and Electric Railway Review
A McGraw-Hill Publication—Established 1884

JOHN A. MILLER, JR., *Editor*

Volume 74 New York, September, 1930 *Number 10*

Electric Railways Doing Well Compared to Other Industries

FOR the first six months of the present year, electric railway traffic was approximately 5 per cent below the corresponding period of last year. Compared with other industries this is a distinctly favorable showing. Statistics for the first half of this year show decreases ranging from 5 to 50 per cent in various lines of business. Among the significant decreases are the following: Department store sales, 5 per cent; coal production, 10 per cent; general manufacturing, 12 per cent; steam railroad earnings, 12½ per cent; textile manufacturing, 15 per cent; metal mining operations, 20 per cent; construction of all kinds, 27 per cent; automobile manufacturing, 31 per cent; metal working industries, 45 per cent; aircraft production, 50 per cent. On the other hand, small increases are shown in total use of electrical energy and in the food industries.

Business statistics for July show a continuation of the general downward trend of the first six months. Electric railway traffic was approximately 10 per cent below that of July a year ago, department stores sales were 9 per cent below, and general manufacturing nearly 20 per cent below. Since the beginning of August, however, there are some indications of improvement in the general business situation. Increased activity is evident in certain industries, with correspondingly increased employment. Recent reports received from a number of electric railways give reason to hope that August traffic figures may make a more favorable showing than did the July figures.

If the improvement which may reasonably be expected occurs during the four remaining months of this year, the electric railways will have suffered a less serious setback than many other industries. This is in line with experience during the business depression of 1921, as pointed out in an editorial in the November, 1929, issue of the JOURNAL, when it was predicted that a decrease in traffic of about 4 or 5 per cent might be expected during 1930. The fact that conditions in this industry were not so favorable a year ago as they were in many manufacturing industries partly explains the reason that the railways have not been more seriously affected. Nevertheless, it is evident that the basic reason for the railways' comparatively good showing is that transportation is an essential service and will be largely used, regardless of general business conditions.

THE PUBLISHERS take pleasure in announcing the appointment of John A. Miller, Jr., as Editor of *Electric Railway Journal*, effective Sept. 1.

Mr. Miller has been on the editorial staff of *Electric Railway Journal* since February, 1923. During the intervening years he has advanced steadily to positions of increasing responsibility and for the past year has been in charge of the editorial conduct of the paper as Managing Editor. His appointment as Editor is a merited recognition of his capacity for editorial leadership. He is qualified for his work by both training and experience, having spent several years in the employ of the Public Service Railway of New Jersey, following his graduation from the course in civil engineering at the Sheffield Scientific School, Yale University.

As a result of Mr. Miller's practical acquaintance with the problems of community transportation and his intimate contact with the field, combined with his experience as a journalist, the publishers look forward with confidence to continued service of a high order to the electric railway industry.

MALCOLM MUIR
President McGraw-Hill Publishing Company, Inc.

Beware of Costly Economies

WITH electric railway earnings at a point considerably below normal, strenuous efforts are being made to reduce operating expenses. This is a perfectly natural reaction to the existing situation. Strict economy is necessary and undoubtedly will produce beneficial results, if not carried to excess. It must be remembered, however, that not every dollar cut out of operating expenses is a dollar gained. To save money by means that will discourage patronage or that will result in increased expenditures at some future date is poor business.

Usually the first step in reducing operating expenses is to cut the service. Under some circumstances this probably can be done to advantage, but under others it is a dangerous practice. At times when headways are short it may be possible to cut the service and continue to carry the traffic satisfactorily without long waits between cars or serious overcrowding. If cuts are made when headways are already long, the effect will inevitably be to deter people from using the service. A reputation gained now for infrequent service will remain to plague the company long after the present business depression has passed into history. There is reason to expect that in the comparatively near future the

economy of using public transportation will appeal to a considerable number of persons who have been using private automobiles extensively in the past. To discourage this tendency by long headways would be extremely shortsighted.

Another usual method of economizing is to curtail maintenance. Here again it is important that great care should be exercised. Maintenance costs have already been substantially reduced from what they were a few years ago. It may be that further reductions can be made with safety. On the other hand, nothing is gained in the long run by neglecting the proper upkeep of the property. Maintenance practices now in effect were originally adopted because they were considered to be economical. If this idea was right then it is unlikely that money can be saved by abandoning the practices now.

Recently a number of railways have attempted to economize by dispensing with the services of certain employees engaged in so-called non-essential work. Certainly their services can be dispensed with if their work really has been non-essential. But it is well to remember that many of the jobs now deemed non-essential were originally created because it was thought worth while to have the work done. If that was true a year ago, the chances are that it is equally worth while to have the work done today.

All this is not to intimate that it is a mistake to reduce operating expenses. Where savings can be made without endangering the future it is highly desirable that they should be made. But it would be a most serious mistake to mortgage the future for the purpose of making a small saving in the immediate present.

St. Louis Should Go Ahead Now

WHETHER or not St. Louis is destined eventually to realize all of the advantages implied by the terms of the report of the transportation survey commission, that report is of more than local interest. For the sake of St. Louis, it is to be hoped that the entire plan may be carried to full fruition, but even if that is not in immediate prospect, some of the proposals should not be remote of realization. Important as is the suggestion contained in the recommendation for the construction of rapid transit lines, that proposal is overshadowed by the more immediate prospects for quick relief contained in other parts of the report.

St. Louis may have to wait for its subways, but there is no reason why it should have to wait over-long to achieve co-ordination of street car and bus service, elimination of parking, rerouting of street cars, elimination of unnecessary stops by street cars, regulation of taxis and the so-called "service cars," co-ordination of traffic control by automatic signals in the business districts, and important street widenings. The recommendation is sound that 800 new cars be purchased, half of the number to be used for replacing cars now operated. This expenditure alone would total $12,800,000. The suggestion that 11½ miles of street railway be constructed confirms the contention of the essentiality of service of this kind.

How the program would be worked out financially is not made plain in the digest of the recommendations so far made public. This, of course, is a most important consideration. As matters now stand in St. Louis, it would be impossible for the local company to meet a capital investment of the kind contemplated unless the continuity of the company financially were assured under adequate franchise provisions.

The ends sought in St. Louis—resulting in greater usefulness of the local transportation system—are the ends the managements of the local transportation agencies in all of the major cities hope to achieve. In many respects, they are civic ends more than they are company ends. No better earnest of faith on the part of the city toward the accomplishment of the purpose of the report could be given than for those responsible for the conduct of the city to proceed at once to put into effect the suggestions for immediate improvement not calling for large capital expenditures.

Principles—Not Details of Regulation Are the Concern of Congress

URGENT need exists for the stabilization of interstate bus operations. That is recognized by almost everyone who has given the matter any serious consideration. The interests of the public, the railways and the bus operators themselves all require it. While the present chaotic situation may work to the advantage of certain irresponsible operators, it is extremely detrimental to those who are endeavoring to give reliable service at reasonable rates.

Before stabilization can be effected, however, the principle of regulation must be legally established. For other types of common carrier transportation service, this principle was established many years ago. That it has not been extended to interstate bus operations has been due to a peculiar set of circumstances, rather than to the existence of any real objection to it. One of the long-established principles of this government is that no one state shall have the right to regulate interstate commerce. It was more accident than design, however, that the law which created the Interstate Commerce Commission restricted its activities to the regulation of rail and water transportation. To correct the situation thus created, legislation has been under consideration by Congress for several years. At the present time the Parker bill, providing for regulation of interstate buses, is on the list of unfinished business of the Senate. When the short session of Congress convenes in December it will come up again for consideration.

The original purpose of this legislation was to empower the I.C.C. to regulate interstate bus operation in the same general way that it has in the past regulated rail and water transportation. For practical reasons it was provided that under certain conditions this authority should be delegated to joint commissions of the states concerned. During the closing days of the past session the Senate committee on interstate commerce made a number of revisions and amendments to the bill as passed by the House of Representatives, which depart entirely from the original purpose. One of these amendments provides for more than one operation on every interstate bus route, thereby not merely permitting but practically requiring competition. Another would prohibit the merger or consolidation of a bus company with a railroad company. Still another amendment has been submitted requiring that no bus operator shall remain on duty for a longer period than eight consecutive hours. Other stipulations proposed are that every bus with a capacity for more than 20 passengers shall have a crew of two men, and that a list shall be kept of the names and addresses of all passengers carried.

Obviously a number of these amendments are entirely impracticable. Doubtless they will be contested on the floor of the Senate and some modifications will be made.

They will be subject also to discussion by the joint conference committee of the Senate and the House of Representatives, and it may be hoped that the bill which eventually emerges will be a considerable improvement over the bill as it stands today.

Regardless of the merits or demerits of these amendments, however, it is evident that they do not belong in a law of this kind. Details of regulation are not the concern of the Congress of the United States. That body should establish the principle of regulation of interstate bus operation. Working out of the details can and should be left in the hands of the regulatory commission.

Cleveland's Two-Cent Fare Zone

NO MATTER what the outcome may be, the experiment of the Cleveland Railway with a 2-cent fare in a restricted downtown section is of great interest to the industry. It is not the first effort of its kind to induce riding and to increase the popularity of the service, but it is different from most of the others. In it no account is taken of economic theories about standby or readiness to serve charges about which there has been so much discussion in the past.

Since Cleveland is under a service-at-cost plan it may be assumed that operation at the 2-cent rate will not be permitted to continue if results foreshadow the exaction of a penalty from riders in other areas. That is to say, the service must be self-sustaining if it is to continue. But even if the revenues no more than balance the cost of the service the company would stand to gain under the theory that the greater the number of people served, the greater is the civic usefulness of the railway.

The present 2-cent rate is admittedly an experiment. It is hoped that from operation under this plan data will be garnered sufficient to settle conclusively whether the proponents of the idea are right in the claims they have set up for its efficacy. The extent to which the people of Cleveland ride in the 2-cent zone would appear to be the only answer to that. If the answer is convincing the entire industry will stand to profit, not because the plan would be generally applicable, but because under conditions comparable to those in Cleveland, the zone system may offer a means of increasing the usefulness of local transportation systems.

Key System on New Financial Basis

DETAILS of the terms of the recent reorganization of the Key System Transit Company are of interest primarily to the holders of the securities of that company, but what was sought to be accomplished is of interest to the entire electric railway industry. The Key System succeeded the San Francisco-Oakland Terminal Railway. Things went fairly well with the company for a while, but then it fell upon evil days. At its promulgation the financial structure of the Key System appeared to fit the needs, but it was subsequently found to be awkward and inflexible. Mortgages containing onerous restrictions soon proved burdensome, a large floating debt accumulated and net earnings eventually were insufficient to meet the fixed charges on $20,000,000 of funded debt. In short, the company suffered not only from external troubles in the way of declining earnings, franchise burdens, excessive taxation, and other difficulties, but also from a set of internal troubles that could only be cured by a readjustment of the financial structure.

In the new financial set-up the reorganizers have gone even farther than was contemplated would be necessary by the committee of the American Association that some years ago reported on such readjustments. In a sense, the matter of physical valuation has been ignored. The effort appears to have been to bring the new financial set-up within the prospects of present earning capacity. This would seem to run counter to generally accepted theories, but those responsible for the reorganization apparently saw no other way out. Funded debt has been cut $15,500,000. The mortgages covering the properties have all been removed. As matters now stand, all of the present funded debt of $4,500,000 is in the form of equipment trust certificates. That debt is less than 18 per cent of the rate-making value. Not only that, but under the terms of the sinking fund of the new $3,500,000 equipment trust issue the company has the option of delivering to the trustee certificates of either the old or the new equipment trust issue, to meet the $431,250 of annual maturities. In other words, the sinking fund may be used to support the market. The previous equipment trust issue of $1,025,000 remains undisturbed.

The new system starts out apparently assured beyond peradventure that all its obligations can be met. That, of course, is propitious. Security holders of the old company now are remote from anything like a fixed lien on the properties of the successor company, but the financial housecleaning, while drastic, holds out hope that eventually the present junior securities may work into a position of real worth. If they do, then those who have just made the present sacrifice will not have done so in vain.

Hitting Them in the Pocketbook

ONLY a gifted satirist could do full justice to the left-handed compliments which successful merchants frequently pay to the local transportation agencies. Again and again these men have tickled our risibilities and brought crocodile tears to our eyes by their agitation at the prospect that traffic by organized transportation agencies might possibly be removed from the streets on which they have the emporiums. While they felicitate each other on their acumen and the extent of their worldly success at the chamber of commerce meetings, Rotary Club lunches or wherever it is that such men gather, they seldom give a thought to the organized transportation agencies. But let it be even hinted that the transportation lines are to be diverted from their stores and they are not the same men. They then see nothing ahead but dark disaster.

Now to hold that these merchants owe their entire success to the accessibility of their stores to the transportation lines would not be warranted. That they do owe a large part of their success to such accessibility, however, has been established beyond a shadow of doubt. Else why would they become so panicky at the suggestion of diverting traffic away from the front of their stores? It is a nice compliment these merchants and tradesmen, big and little, pay to the organized transportation agencies by the vehemence of their opposition to practically all suggested traffic rerouting. But it would be better still if their concern for the welfare and the continuity of the local transportation service and its conduct on a profitable basis began to manifest itself before the prospect arose of their having their own pocketbooks flattened.



Service in Mobile is given by rolling stock maintained at a high standard. Thirteen new cars similar to the one in the foreground have been purchased in the past three years

Mobile Bids for Patronage with

Clean Cars, Close Headway *and* Smooth Track

By

CLIFFORD A. FAUST

Assistant Editor *Electric Railway Journal*

CITIES with a population of 100,000 and under are passing through a crucial period of their transportation history. No one denies this fact. Studies of their problems over the past two years by the small-city committee of the transportation and traffic association have revealed a number of common causes for their troubles. Unsatisfactory financial set-ups, competition from the privately owned automobile, a trend toward walking when service is not sufficiently frequent, inadequate fares, excessive taxation and other burdens, a feeling that the street car is an obsolete form of transportation and competition from unregulated taxicabs and jitneys have all contributed in some measure toward the present difficult situation.

To combat these unfavorable factors many cities have made real and definite progress. By frank and open discussions they have secured relief from unreasonable franchise requirements, they have modernized their rolling stock as extensively as possible, they have improved service by speeding schedules and operating as many cars as the traffic will justify, they have intensively cultivated public relations and by modern merchandising methods and active solicitation of patronage have made real progress. And their efforts have not been in vain. Almost every small city that has assumed an aggressive attitude in meeting its problems has improved its status.

In the southern part of Alabama, one of these cities is doing many notable things not only to retain its prestige but also to move definitely forward. It is Mobile, a city of approximately 75,000 population, and served by an independent electric railway, the Mobile Light & Railroad Company.

Extensive rehabilitation of physical plant, accompanied by many other steps to improve service and better public relations, has placed the system in a favorable position

An analysis of the local transportation situation in Mobile reveals that many of the unfavorable factors present in most small cities also exist there, but that the railway has singled out each individual one, and, through careful studies of the problems, has taken definite steps to solve them.

Among the favorable aspects of the Mobile situation, however, there is one which stands out above all the rest. It is the unbounded optimism of the management and the excellent *esprit de corps* all through the organization. Both J. H. Wilson, president of the company, and F. F. Rossman, vice-president and general manager, have faith in the city of Mobile and in the transportation system they manage. They know that Mobile is an industrial city, that the South is making great strides in its industrial activity, that the city is growing steadily and that a reliable system of transportation is a vital part of this great center. They have faith in the city to the extent that they are continually improving the railway service. This same spirit is apparent in the other officers of the company, in the shop employees and in the men on the cars.



Eleven lines of the Mobile Light & Railroad Company effectively serve all parts of the city. The three lines to the north and the Spring Hill line to the west have private rights-of-way in the suburban areas



At left is a view in the business district of the city showing one of the double-truck cars used for suburban service and two city cars

Financially the company is in very sound condition. It has never been in receivership, it has only a small bonded indebtedness at the present time and has allowed a large amount each year for depreciation. In retaining this sound financial condition, the company has not neglected its physical plant. Every part of the system has been well maintained.

Only recently the company received seven new single-truck cars of modern design. This order followed one for six cars of a similar type which were placed in service 2½ years ago. All of the other cars are kept in as attractive condition as possible. The rolling stock of the company is painted and overhauled every 30 months, so that the cars always present a good appearance.

One of the greatest assets of the company is its extensive mileage of new track and the small mileage of single track on city lines where two-way operation is necessary, 0.75 mile, to be exact. The city of Mobile has been repaving its important arteries over the period of the past eight years and has included almost every street on which the electric railway has car lines. In all of this work the company has joined in rebuilding its track with a smooth, permanent type of structure. Its power distribution system, likewise, has been modernized.

Particular pride is taken by the company in its maintenance facilities and standards. A modern car shop; a well-arranged carhouse, equipped for light repairs; the use of the work order system of maintenance; the establishment of high standards, and the employment of an experienced and interested group of shop men have all contributed to the improvement of the equipment and the reduction of maintenance cost.

Another favorable factor for the company is that it is faced with no bus, jitney or taxi competition. A few interurban bus lines serve the city, but they are not permitted to carry local traffic.

Even though the company does not have any mass vehicle competition, it has altered its routes to serve the city more efficiently and to eliminate any duplication of service. By abandoning certain short portions of its route and building new track, it has eliminated unnecessary mileage, without impairing the service.



The executive offices and trainmen's quarters are located in this building on Spring Hill Avenue. The well-arranged carhouse at the rear is designed for storage and light repairs

Fast Schedules Maintained on All Lines

On three lines, extending into suburban districts on the north, and on one line extending west, private right-of-way is used. High-speed, limited service is given at frequent intervals on these lines and schedules distributed to inform the patrons of the leaving times. One of the limited cars on a county line makes only four stops in the outlying district and then runs express the remaining distance. On the 7-mile trip ten minutes is saved. With this schedule the car reaches the city in less time than automobiles. Business has increased to such a volume on this line that the company is considering adding trailers. On all its lines, the company is maintaining as close a headway as possible. To accomplish this it is steadily increasing the number of car-miles and car-hours operated. Last year, for example, the company operated 2,180,412 car-miles, as compared with 2,160,525 in 1928, an increase of 19,887. Car-hours in 1929 were 1,223 in excess of the number operated in 1928. The management realizes that in a city the size of Mobile a great number of people walk to the business center if a car is not in sight, and therefore offers the maximum service to the public. The importance of this is emphasized by the fact that the maximum ride in Mobile is 24 minutes and the average ride is approximately 15 minutes. Studies of traffic and walking distances are constantly being made by the company to ascertain whether or not the schedules are satisfactory. Rush-hour headways on residence lines now range from 5½ to 8 minutes. Along with shortening headways the company has increased its schedule speeds. City lines now average 8.92 m.p.h. and county lines 11.50 m.p.h.

At present the company receives an 8-cent cash fare and sells four tokens for 30 cents. During 1929 the average fare per revenue passenger was $0.0753. This figure is the result of a steady increase in the fare over a long period of years.

Two very valuable assets of the company are its excellent public and employee relations. The company boasts of a very clean court record, evidence of the favorable attitude of both the public and the attorneys toward the electric railway. Special care is taken in answering inquiries of patrons and giving consideration to suggestions that are sent in. The company also advertises civic events and programs of numerous organizations on its cars.

Employee relations in Mobile are exceptionally good, no major labor troubles having developed. Group insurance is offered to those employees who desire it. Although no extensive safety campaign has been conducted, talks on the subject are given frequently enough to keep the employees alert to the dangers of careless operating. This is stressed not only for the operators, but also for all the other men employed. The company has made its Monroe Park shop almost 100 per cent safe by proper installation of machines and use of many safety devices.

At regular intervals talks are given the trainmen on neatness, courtesy, efficient operation and merchandising. These have aided considerably in improving the work of the men and in stimulating them to sell the service.

Every attempt is being made by the company to lower its operating expenses. A gradual change-over from two-man to one-man operation has taken place, so that at the present time only two county suburban lines are using two men. A detailed analysis of all expenses by departments is made monthly and followed by lectures to the superintendents on ways and means of reducing costs.

The superintendents, in turn, instruct their men in a similar manner. By careful purchasing and paying for all materials and supplies outright the company has been able to reduce costs to a minimum.

Probably the biggest handicap to the Mobile railway system is the psychology of the public with regard to riding on street cars. Although in several parts of the country this feeling has developed, probably in no part has this psychology developed to such a detrimental state as in the South. Mobile, like many other cities in the southern states, has suffered a loss in riding partly because of this attitude. Of course, the private automobile is the greatest competitor of the railway and is responsible for much of the shrinkage in patronage. It has harmed the railway not only in removing the actual drivers from the street cars, but also in picking up prospective patrons and in congesting the downtown streets, slowing up car movement. A rather unusual problem of the company has been the necessity to rebuild track which was in excellent condition. It is likely that the company will have heavy paving burdens for the next ten years.

Thirteen New Cars Purchased

In its program of rolling stock modernization the Mobile Light & Railroad Company bought six single-truck, Birney one-man cars in 1927 and seven more in April of this year. Of the latter order four were built by the Perley A. Thomas Car Works, High Point, N. C., and three by the American Car Company, St. Louis, Mo. The cars seat 33 passengers, weigh 20,500 lb., are equipped with all safety devices and are designed for double-end operation. Double folding doors at the front, an exit at the rear for colored patrons and a very wide aisle permit a rapid exchange of passengers. The wide aisle has the great advantage of allowing the colored patrons entering the front to pass the white passengers without contact.

In the past seven years the railway has rebuilt approximately eight miles of track. By years the reconstruction was 1.444 miles in 1923, 0.982 in 1924, 0.2699 in 1925, 0.547 in 1926, 0.756 in 1927, 0.885 in 1928 and 2.943 in 1929. For 1930, the figure will total about 0.818 mile. Only 2.355 miles of streets with car tracks within the city limits remain unpaved. It is expected that within the next year or two they will be hard surfaced also.

A very interesting type of construction has been employed in rebuilding all of the company's tracks. A 6-in. coarse slag ballast is surfaced with a 3-in. layer



An extensive program of track rebuilding during the past eight years has included a large proportion of the city lines



Pouring concrete over the ties, preparatory to laying the paving surface

of fine slag ballast. On this 7 in. x 8 in. x 8 ft. creosoted pine ties are laid on 2-ft. centers. Dirt is filled in on top of the 3-in. layer to the top of the ties, extending the full width of the ties. This is well tamped and then covered with a 5 or 6-in. layer of concrete, the depth depending on the type of paving surface used. An outstanding feature in the construction is the pouring of concrete underneath the rail section between alternate pairs of ties, made integral with the top layer of concrete. The slabs are 16-in. wide and extend to the same depth as the ties, 7 in. This type of construction ties the base definitely to the rail, so that if there is any movement the pavement and rail will move together. As a result no paving breaks have occurred or are anticipated. T-rails of 82-lb. section, 7 in. in depth, or 7-in. girder rails of 103 or 122-lb. section are used in the construction. The company has approximately 4,400 Thermit-welded joints at present and is expanding this number, as all new construction will have this type of joint.

Work Order Maintenance System Effective

Much of the effectiveness of the shop department is due to the use of a work order system. Before any maintenance can be performed a work order sheet must be filled out, stating the nature of the work, the materials required and the estimated cost of both materials and labor. The system has aided materially in reducing costs and in improving the efficiency of the shop employees. All cars are inspected on a 1,000-mile basis and completely overhauled and painted every 30 months at the Monroe Park shop.

An efficient layout at the Central carhouse reduces car movements to a minimum and permits rapid storage and dispatching. Sixteen tracks, extending the full length of the yard, are served by a single ladder track at each end. These ladders are so joined to the two tracks on the adjoining avenue that one can serve as an entrance only and the other as an exit. Eight of the tracks pass through the carhouse and have 172-ft. pits for inspection and light repairs. Fronting on Spring Hill Avenue is the main building with the company's offices, trainmen's quarters and a shop.

Summing up the situation in Mobile, we find that it has problems similar to those encountered on other properties of comparable size, and that it is taking definite action to combat them. The company officials have an optimistic outlook, the financial condition of the company is sound, its rolling stock is well maintained, its track is in large part new, the service has steadily been improved and the company enjoys an excellent state of relations with its public and employees.

New Braking Apparatus Demonstrated

BEFORE a group of more than 50 electric railway officials and manufacturers from all over the country, a demonstration was given on Aug. 14, at Pittsburgh, Pa., of a new type of braking apparatus developed by the Westinghouse Traction Brake Company. This apparatus, called a "traction booster," was installed experimentally on car No. 4936 of the Pittsburgh Railways. It combines features of the familiar air brake and of the magnetic brake, and, at the same time, overcomes some of the limitations of those two systems. While the air brake is extremely flexible it is limited in over-all effectiveness by the adhesion between wheel and rail, so that, under the most favorable conditions, the stop obtained with a street car is about two to three times as long as the best automobile stop. The magnetic track-shoe brake to a certain extent is less dependent upon rail friction, and, when used in conjunction with an effective air brake, provides a shorter stop than can be obtained with the air brake alone. The main limitations of the track-shoe brake are its relative inflexibility and the high maintenance of its track-shoe mechanism.

The "traction booster" consists of two magnets on each truck which are spring-suspended $\frac{5}{8}$ in. above the rail. When the brake cylinder pressure exceeds a predetermined value, a switch is automatically closed, thus energizing the magnet coils. The magnets do not come in actual contact with the rail, but exert a magnetic pull on the rail which, in effect, increases the weight of the car. The increased adhesion between wheel and rail, resulting from the magnetic pull, permits the use of a higher retarding force without danger of wheel sliding. On the demonstration car, which weighs approximately 44,000 lb., the magnetic effect amounts to 6,000 lb. per truck, a total of 12,000 lb., which represents an increase in adhesion of 28 per cent. The booster itself produces little retarding effect, its function being to increase the adhesion to such an extent that higher brake cylinder pressures can be used safely. In this way, the full flexibility of the air brake is retained, and the higher rate of retardation made possible by the booster need not be used unless desired.

In the tests, stops were made at retardations of 4 m.p.h.p.s. without the booster and 8 m.p.h.p.s. with it. Those at 4 m.p.h.p.s. were intended to show what can be accomplished through present standard air-brake devices, with some consideration for the truck and car body members with respect to ability to withstand the forces employed. For this purpose a braking ratio of approximately 138 per cent was used.

The stops accomplished at a retardation rate of 8 m.p.h.p.s. required the assistance of the traction booster. The braking ratio was 275 per cent, based on the actual car weight of 44,000 lb. and was approximately 215 per cent based on the effective weight of 56,000 lb. The practical use of a braking ratio of 215 per cent was possible because of the fact that the rails were sanded and a retardation controller was employed to reduce the peak of retardation which occurs at the instant of stopping.

The retardation controller consists of a cylindrical weight moving freely between rollers in a tightly sealed case, but held in balance or neutral position by opposing springs at each end. If the retardation exceeds a predetermined value the weight moves, and in doing so opens a valve which in turn reduces brake cylinder pressure. The friction characteristics of cast-iron brakeshoes are such that unusually high friction occurs at very low speeds, such at at the instant of stopping. This causes a surge or jerk in the car, and in view of the unusually high forces employed, would be objectionable unless controlled in a manner as indicated.

Results of these tests are shown in the following table:

Results of Braking Tests without and with Booster

Retardation of 4 M.P.H.P.S.				Retardation of 8 M.P.H.P.S.			
Speed M.P.H.	Dist. Feet	Time of Stop Sec.	Ret. M.P.H.P.S.	Speed M.P.H.	Dist. Feet	Time of Stop Sec.	Ret. M.P.H.P.S.
10	20	2.4	4.1	10	13	1.3	7.7
20	65	4.6	4.3	20	41	2.4	8.3
30	160	7.2	4.2	30	93	3.6	8.3

The apparatus installed on the demonstration car is in purely experimental form and does not represent a commercial design. It was demonstrated merely to show the possibilities of equipment with retardation rates of 8 m.p.h.p.s., as well as the effect on car body and trucks of these high retarding forces necessarily applied, viz., a braking ratio of 275 per cent.

Guests attending the braking demonstration were also afforded an opportunity to inspect car No. 4731, which has been equipped with a new type of trucks. These trucks have been developed jointly by the Westinghouse Company and the Pittsburgh Railways. They are designed for four 50-hp. motors, WN drive, and 22-in. wheels. Dynamic braking is provided, as well as air-operated drum brakes on the axles. The truck members are welded together, and a substantial saving in weight has been effected.

A.I.E.E. to Revise Standards for Control Apparatus

STANDARDS for railway control apparatus have been made the subject of a report issued by the standards committee of the American Institute of Electrical Engineers. This is a tentative revision of the present Standard No. 16 printed under date of July, 1925. The report is not considered by the committee as being final, but is presented with the hope of obtaining opinions, criticisms and suggestions of all parts before it shall be approved.

The report presents the accepted definitions of all control apparatus and equipment as used under specified service conditions. It follows with the standard definitions of the various kinds of ratings and the manner in which they should be expressed. Temperature limitations of coils, resistors and other parts, and, also, limitations other than those due to heating are defined. The report also describes the various classes of insulation and the standard methods of making temperature determinations and dielectric tests.

The principal changes suggested in this report concern the definition of the limits of temperature rise for coils and mechanical parts, and the determination of the mean temperature of a copper winding by measurement of its resistance when the resistance at some reference temperature is known.



Trolley buses on Central Avenue, Chicago, are operating more than 3,000 miles and carrying nearly 30,000 passengers per day

Operating Statistics Prove

Success of Trolley Buses

in Chicago

Popular approval has warranted extension of this type of service. New equipment recently ordered will bring total number of vehicles to 70. Schedules, traffic and operating costs discussed in a paper presented before the Wisconsin Utilities Association.

By

F. A. FORTY

Superintendent Schedule and Traffic Department
Chicago Surface Lines

RECENT rapid developments in trolley bus design have placed this vehicle beyond the experimental stage. The developments in light-weight, high-speed motors, automatic control, large capacity light-weight bus bodies equipped for circulating loads, pneumatic tires and excellent riding qualities have made the trolley bus a vehicle which is headed towards widespread adoption. The successful installation of the trolley bus in Salt Lake City, the more recent large scale installation in Chicago and elsewhere have demonstrated that this vehicle has great possibilities in the transportation field.

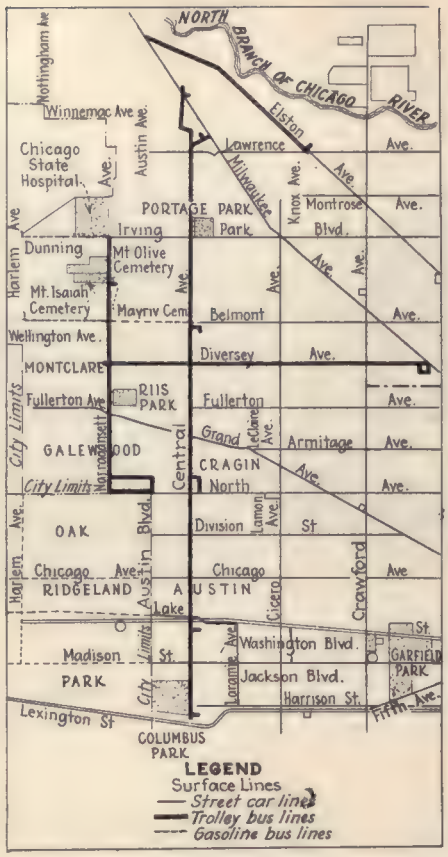
Trolley bus service was first inaugurated in Chicago on the Diversey line in the northwest section of the city on April 17, 1930. Additional trolley buses were subsequently placed into operation in the same section of the city on the Central Avenue, Narragansett Avenue and Elston Avenue lines on June 8, June 29 and July 1, 1930, respectively. These operations, together with the operation of three lines using gasoline buses, were the result of a decision by the Illinois Commerce Commission dated March 6, 1930, directing the withdrawal of Chicago Motor Coach Company buses from the northwest section of the city and directing the Chicago Surface Lines to establish bus service as extensions of its rail lines in this territory.

The original order for trolley buses totaled 41 vehicles, of which 29 were built by Twin Coach Corporation, six by Brill-American Car Company, and six by the St. Louis Car Company. Within a few weeks after service was started, additional trolley buses were needed and the fleet was increased to 55 by the purchase of seven Twin Coaches and seven Brills. Recently seven more

Twin Coaches and eight Brills have been ordered. This latest order will be delivered in September and will bring the total number of trolley buses operated in Chicago up to 70.

Diversey route, 3.81 miles in length, is operated over a fairly wide street with new pavement. Approximately 1 mile of the route was formerly served by a one-man rail car line. The present bus route intersects two important rail trunk lines and taps the Milwaukee Avenue line, which is the most important and heaviest rail trunk line on the northwest side. A wye at the west end and a loop at the east end serve as terminals. The line does a thriving business, inasmuch as 19,400 riders are handled on a normal weekday. The average number of riders carried per vehicle-mile amounts to 9.58, while the average number per vehicle per day amounts to 1,140. Seventeen trolley buses are required to operate the line. A 2½-minute headway is operated during the rush hours, when the maximum passenger flow reaches 1,370 in the heaviest half hour. A 6-minute headway is maintained during the base, and a 6⅔-minute headway during the evening. In spite of the difficult conditions, relatively high speeds are maintained. The speed between terminals ranges from 11.72 m.p.h. during rush hours for the direction of heaviest travel to 13.05 m.p.h. during the base. The all-day speed between terminals is 12.33 m.p.h.

Central Avenue route, which is 6.98 miles in length, is an important north and south line arranged with wyes at both terminals. Poor pavement in the north section where an 18-ft. strip in the middle of the street has been left unpaved, a narrow bridge with a 17-ft. roadway, and a 1.75-mile stretch of rough pavement where the roadway width is only 28 ft., have all imposed severe operating conditions on this line. The route does a large volume of business, carrying 29,500 riders on a normal weekday. The density of riding is quite high, since the rides per vehicle-mile amount to 9.45. Twenty-five trolley buses are required to operate the line during rush hours, when a 3.15-minute headway is maintained. A 6.4-minute headway is maintained during the base and a 7¾-minute headway during the evening. The speeds maintained between terminals are relatively high, considering the poor pavement and narrow street widths. The speed ranges from 11 m.p.h. during rush hours for the direction of heaviest travel to 11.97 m.p.h. during the evening. The all-day speed is 11.47 m.p.h.



Four heavy-duty extensions to rail service are being successfully operated with trolley buses in the northwest section of Chicago

The number of riders carried per vehicle-mile on these two lines shows that the service is well patronized. The 40-seat buses used on both lines are used to full seating capacity at the heaviest loading points along the line during non-rush periods. During rush hours the average number of passengers per bus at the heaviest point along the routes is now 60. The additional buses to be acquired for these routes will reduce this to 55, which is a more satisfactory rush-hour standard. The wide double door for the front entrance and exit and the rear door exit permit effective circulation of passengers. On the Diversey bus route the average length of stop is short, varying from five seconds during the midday to 7.2 seconds during rush hours. The rear door exit is used to great advantage during the rush hours, as 25 per cent of the total passengers alighting use this exit. Street men also use this exit door for loading passengers at concentrated loading points.

Operation of the trolley bus in Chicago has shown that this vehicle is capable of easily maintaining speeds

Operating Statistics of the Chicago Trolley Bus System

	Diversey Avenue	Central Avenue	Narragansett Avenue	Elston Avenue
Distance between terminals	3.81 miles	6.98 miles	3.50 miles	2.86 miles
Number of buses used during morning rush	17	25	5	4
Number of buses used during base	7	13	5	3
Number of buses used during afternoon rush	17	25	5	5
Number of buses used during evening (8 to 10 p.m.)	7	13	5	3
Average inbound morning headway in maximum half hour	2.50 minutes	3.15 minutes	6.75 minutes	7.25 minutes
Average headway during base	6.00 minutes	6.40 minutes	8.00 minutes	9.00 minutes
Average outbound afternoon rush headway in maximum half hour	2.65 minutes	3.15 minutes	6.75 minutes	6.00 minutes
Average headway during evening (8 to 10 p.m.)	6.66 minutes	7.75 minutes	7.80 minutes	9.00 minutes
Scheduled speed inbound during morning rush	11.72 m.p.h.	11.00 m.p.h.	11.66 m.p.h.	13.70 m.p.h.
Scheduled speed outbound during morning rush	13.05 m.p.h.	11.33 m.p.h.	12.72 m.p.h.	14.90 m.p.h.
Scheduled speed inbound during base	13.05 m.p.h.	11.65 m.p.h.	12.72 m.p.h.	14.90 m.p.h.
Scheduled speed outbound during base	13.05 m.p.h.	11.65 m.p.h.	12.72 m.p.h.	14.90 m.p.h.
Scheduled speed inbound during afternoon rush	12.70 m.p.h.	11.33 m.p.h.	12.72 m.p.h.	14.90 m.p.h.
Scheduled speed outbound during afternoon rush	11.75 m.p.h.	11.00 m.p.h.	11.66 m.p.h.	13.70 m.p.h.
Scheduled speed inbound during evening	12.70 m.p.h.	11.97 m.p.h.	13.10 m.p.h.	14.90 m.p.h.
Scheduled speed outbound during evening	12.70 m.p.h.	11.97 m.p.h.	13.10 m.p.h.	14.90 m.p.h.
Scheduled speed all day	12.33 m.p.h.	11.47 m.p.h.	12.64 m.p.h.	14.38 m.p.h.
Maximum hourly passenger flow during morning rush	1,370	1,257	455	280
Maximum hourly passenger flow during afternoon rush	1,370	1,235	433	665
Total daily rides	19,398	29,533	6,362	4,426
Total daily vehicle-miles	2,026	3,128	1,102	841
Average number of rides per route-mile per day	2,544	2,114	910	774
Average number of rides per vehicle-mile	9.58	9.45	5.78	5.26
Average number of rides per vehicle per day	1,140	1,284	1,060	856

of 12 m.p.h. on busy routes in outlying territory. Speeds as high as 15 m.p.h. can be reached where the density of travel is not too great and where operating conditions are quite favorable. It has been found, however, that this commendable speed performance of the trolley bus does not exceed the speed performance of the modern one-man rail car with the same conditions of operation, volume of business and number of stops per mile.

The operation of the trolley bus on our present routes provides a higher quality and a more economical brand of service than would be possible with gas bus operation. The lower energy and maintenance costs on the trolley bus reduce the operating expenses approximately 5 cents per bus-mile. This saving produces a marked operating economy and does much toward wiping out the fixed charges incidental to the investment in trolley structures. On the Chicago system, trolley bus operation will show a saving over gas bus operation on any average headway up to fifteen minutes. At that frequency the total cost of operation for the two forms of transportation will be the same.

Introduction of the trolley bus in the transportation field has aroused a great deal of speculation as to where and when it should be used. No ready formula can be set up to determine its adaptability on any route in any city. Individual routes within a given city vary greatly in the volume, character and distribution of the riding throughout the day. Transportation companies differ from one another in standards of service, construction standards, labor costs, and in working agreements with the trainmen which affect the cost of operation to a great extent. The trolley bus can be used in a very large city only to a limited extent. On our property, 82 per cent of our total car service is rendered on lines where the rush-hour traffic requires a rail car headway varying from 2½ minutes down to one-half minute, and a non-rush hour headway varying from six minutes down to two minutes. Modern rail car operation on this 82 per cent of the system gives better and more economical service than would be possible with the trolley bus.

Probably the trolley bus will play an important part in the local surface transportation system of many cities. In a large city it can be used to supplement the rail car operation by serving outlying and other districts where the volume of traffic will not support rail car operation. In medium-sized cities it can be used to supplement principal rail car arteries and serve outlying districts. In smaller cities it may be more economical to serve the principal routes with trolley buses and the outlying routes with small-capacity gas buses.

Modern Design

Features Windsor Cars



Attractive features are found in the motor and trailer cars just delivered to the Windsor, Essex & Lake Shore Railway

FOUR motor cars and a trailer of special design have just been put in service by the Windsor, Essex & Lake Shore Railway, operated under the supervision of the Ontario Hydro-Electric Railways. These cars, which include the most advanced design of interurbans in Canada, represent to a large extent the ideas of W. R. Robertson, general superintendent, working in conjunction with the Ottawa Car Manufacturing Company.

The bodies of the five cars are of the same dimensions, being 51 ft. 2 in. long over anti-climbers and 37 ft. 8 in. over body corner posts. The width over side sheathing is 8 ft. 3⅛ in., and the width over vestibule corner posts is 7 ft. 7⅜ in. From the rail to the top of the roof the height is 11 ft. 2⅜ in., and from the rail to the top of floor it is 3 ft. 5 in. The framing is of steel.

The motor cars are arranged for double-end operation, being fitted with an electro-pneumatically operated door and folding step at each corner. There is a main compartment with 40 seats and a smoking compartment with ten seats. In the main compartment the seats are arranged transversely on each side of an 18-in. aisle. They are of the semi-individual bucket type, upholstered in plush. All except the end seats are reversible. In



Observation compartments of the new Windsor cars are luxuriously furnished

the smoking compartment, on each side of the aisle, there is a leather-upholstered settee for five. The lighting is by ceiling dome fixtures along the center line, five in the main compartment and two in the smoking room.

The design of the trailer is special. It has seats for 50. There is a central main compartment with 28 seats, and at each end an observation room which, including the vestibule, is about 15 ft. long. The side window sash are 42 in. long by 30 in. high. In the main compartment the seats are of the semi-individual bucket type, of deep double spring construction, with 24-in. backs, arranged transversely. They are plush upholstered. At one end of the car tables are placed between the two end seats and the adjoining ones.

The observation room, or solarium, at one end of the car has on each side a settee with plush-upholstered seats for five. The room at the other end of the car has on each side four large chairs upholstered in plush, and a settee upholstered in hand-buffed Spanish leather conforming to the semi-circular vestibule end.

In each motor car the operator's compartment is partitioned off from the main body of the car, and there is a wood and glass partition between the main compartment and the smoking room. In the trailer both observation compartments are partitioned off from the main compartment.

The cars have interior finish of birch mahogany, and the exteriors are finished in blue with yellow trim.

The motor car trucks have 33-in. wheels carrying 100-hp. Westinghouse motors. HL control is used, the controller being lowered to the floor at the operator's position so as to bring the top to a convenient height.

Considerable thought was given to the design of the cars to secure good appearance, comfort for passengers and economy in operation, and to afford the road's patrons something original in the way of passenger equipment. The design provides a pleasing appearance, with the streamline effect much in evidence. The large windows and the window guards arranged to drop into pockets in the car sides add to the appearance. Vestibule door openings have a set of double doors for the winter season. Both inside and outside doors are operated by the same engine.

Making Sleep Easy on the Interstate

MODERN coil spring mattresses have been adopted as regular equipment for lower berths on the all-steel sleeping cars operated between Indianapolis and Louisville by the Interstate Public Service Company, thus keeping pace with the latest developments in sleeping car equipment.

The mattresses were especially designed to fit the extra length berths of the Interstate sleepers, which are 4 in. longer than in standard Pullman cars.

The new mattresses are 4 in. thick and consist of rows of 3-in. coils compressed to a height of 2 in., a layer of woven hair, and a 2-in. layer of hair padding. Each of the coils is set in an individual canvas pocket.

New Shop Unit Begun in Chicago

CONTRACTS for construction of the second unit of the Chicago Rapid Transit Company's shops at Niles Center were let on Aug. 11 and ground broken for the structure on the following day. The first unit, the paint shop, was built three years ago. The new unit, which will cost $375,000, is 200x252 ft. in outer dimensions. It is being built directly south of the first unit at Oakton Street and Hamlin Avenue, and will be used as a construction shop for repairing and remodeling cars.

The building will be rushed to completion as rapidly as possible so that work may be started on remodeling cars to make them suitable for eight-car train operation, the longer trains being necessary when the consolidation with the Surface Lines is effected and the transfer system between the "L" and surface lines inaugurated.

The complete plans for the Rapid Transit Company's shops call for the construction of ten units at a total cost of $4,500,000, covering an area of ¼ mile square. When all completed the shops will be capable of handling a total of 4,500 cars, with a storage capacity in the yards for 350 cars.



Architect's drawing of the second unit, recently started, of the Chicago Rapid Transit Company's Niles Center car shop

UTILITY VALUATION

Demands Logical Treatment

Physical property is the basis of the utility, and its real value fluctuates but little in its ability to render service. Its value in terms of the dollar, however, changes with purchasing power and must be determined from time to time

By

JOHN W. BURKE

Consulting Engineer
New York City

UNDER our law, rate making is a function of the legislative branch of the government. Rates must be made by authority of the State legislatures or of Congress. Although in the early days there were numerous cases in which the legislatures and the incorporators of new utility companies agreed on the rates to be collected and had them expressed in the charters, it soon became manifest that the legislatures could not themselves arrive at fair rates, and especially that they could not directly exercise their power to supervise and regulate the public utilities. Hence, about the beginning of this century, many of the states organized public service commissions, and those which formerly had them increased their scope, so that for years past these commissions have administered the duties of regulation and rate making through the powers delegated to them by the legislatures.

This work of the commissions has proved to be as difficult as it is important. Some may permit too large a depreciation reserve in those prosperous utilities that can collect it. On the other hand, they are sometimes inclined to adopt a method of valuation which confiscates a portion of the company's property in arriving at a rate base. This error is due to a misconception of World War effects. The popular impression is that one effect was to increase costs, whereas the real result was to depreciate the currency. Bearing in mind the purchasing power of the dollar, only a few items of construction or equipment cost substantially more now than in the decade before the war, but this fact is not generally recognized.

Just as real wages differ from money wages, so do real costs of construction differ from the costs in current dollars. Even when money wages are constant, real wages may fluctuate considerably from adventitious causes, such as climatic conditions affecting wheat and other food supplies, and speculation in various commodities. Not so with real construction costs. They have a unique record of stability.

Real cost of construction, outside of engineering, legal and overhead costs, is properly measured in foot-pounds of energy expended by manual labor, machinery or fuel. The energy necessary is the same one century as another. Nor is there any marked fluctuation in the money cost of construction measured in a stable currency. The progressive economies resulting from improved manufacturing and transportation methods, and from substituting power and machinery for manual labor, are substantially offset by the higher wages paid the remaining manual labor. We are inclined to divide construction between materials and labor, the latter including only labor in the field. But the materials delivered are comprised almost wholly of labor, including mining and transporting the ore, building the railroad and cars on which it is transported, mining and transporting the fuel that smelts it, rolling or drawing the smelted iron and copper, fabricating it into machinery, loading and conveying it to the point of delivery.

Labor's Share in Profits Increases

For many generations the share of labor in the fruits of industry has been increasing, and it must continue to increase. The net result has been a slight upward trend in construction costs, and this must continue unless our civilization becomes static, or the labor-saving devices in the future prove more decisive than those of the past.

The popular impression that present construction costs are far in excess of pre-war costs is due to the fact that they are measured in new dollars worth only 60 to 70 per cent of the former dollars. And to this also is due the popular fallacy that property is enhanced in value, and especially that a utility is freely given a new and fictitious value, when all that happened was to translate one set of dollars into another set of the same aggregate intrinsic worth. It goes without saying that courts and commissions should have a sounder philosophy than that commonly prevailing among the public.

Error in "Prudent Investment" Theory

If it were possible to ascertain the original costs of a property constructed and installed under honest and efficient direction, and these costs were translated into present dollars, we should have the present "prudent investment" in that property; and that investment would be the same as the present reproduction cost new. But the popular application of the "prudent investment" method of valuation, which in some quarters it is proposed to use in a popular formula, involves the error noted in the preceding paragraph. The method of its

leading proponents is to try to find, for example, the number of dollars originally invested, say, in 1900 and add the number of 90-cent dollars invested in 1910, the number of 50-cent dollars in 1920 and the number of 65-cent dollars in 1930, along with all the intermediate systems of dollars, and call the numerical sum of these the present investment in dollars. This is not the only difficulty with the "prudent investment" method. The Interstate Commerce Commission reports show that in only a few of all the cases examined was it possible to find the original cost or "prudent investment" in any kind of money. If the Interstate Commerce Commission, with its extensive staff, cannot find these amounts there is little promise that the state commissions will be more successful. As might be expected from commission members who have given deep study to this special problem, only a few give countenance to the illogical application of the "prudent investment" theory.

As a practical matter the differences between "prudent investment" and "fair value" could be reconciled by a little clear thinking and precise expression. The investment is not cash; it is the physical property dedicated to the public use. We need not speculate as to how many dollars the bondholders, the stockholders, the contractors or others furnished the company to enable it to place the property in service. We need not make a doubtful attempt to find what premiums, commissions or discounts were paid to, or what losses were suffered by, the various people who made it possible to render this service. The only parties to the public contract are the company and the public, and what is used by the one party in serving the other is precisely the physical property. There is nothing speculative about that. Anyone can see it, and note its extent and condition.

The actual investment at any given time is resolved into the dollars of the time by taking an inventory of the physical property and pricing it for reproduction cost new, then deducting such depreciation, if any, as is proper in the circumstances. Always it is the property itself that is the investment, and the best place to look for it is not in the books of account but on the ground.

While "prudent investment" and reproduction cost new should be substantially the same amount, it does not follow that either can be assumed as the fair value. As a matter of law and good judgment, the "fair value" may be more or less than the investment, depending on the circumstances in each case. It is subject to determination by the courts and commissions, and not by others.

Province of the Court in Valuation

One of the most disturbing conditions in this country is the unfriendly attitude of the public toward valuation by the courts. Frequently a commission decision is reversed by the courts. If this happens in the federal instead of the state court the irritation is further increased.

But in general there is no appeal from the commission to the court except on a grave charge—that of confiscation. And unless confiscation is proved, the commission cannot be reversed. Where does the fault lie? With the court which performs an unpopular duty, or with the commission which has not been so careful? It is the prerogative of the commission to make the rate. In doing so it must find the value of the property. It is only on an authentic showing of confiscation that any court can assume jurisdiction.

The Supreme Court is the final interpreter of law in the United States, and in certain contingencies for the several states. Certain engineers and commissions and some of the courts are insistent in their request that the Supreme Court establish a formula for valuation, or at least apportion the weight that should be given to reproduction cost as compared with the other factors to be considered. The answer to this request may be found in the decree of the court delivered by Chief Justice Hughes, then an associate justice, on the Minnesota Rate Cases in 1912:

> The ascertainment of that value is not controlled by artificial rules. It is not a matter of formulas, but there must be a reasonable judgment having its basis in a proper consideration of all relevant facts.

We see no good reason why the court should be expected to reverse that principle, and little prospect of its further expansion or elucidation. In so intricate a problem as valuation the "reasonable judgment" of trained and competent arbitrators would seem a safer guide than an inert formula. A general principle expressed by a tribunal of such character as the Supreme Court should be applicable to conditions of the distant future as well as of the present, and through periods of either deflation or inflation.

Supreme Court Decisions Based on Smyth vs. Ames

The relevant facts to be considered were first set forth by the Supreme Court in Smyth vs. Ames, 169 U. S. Certain things were specifically listed but the need for including other elements was recognized as follows:

> In order to ascertain that value, the original cost of construction, the amount expended in permanent improvements, the amount and market value of its bonds and stock, the present as compared with the original cost of construction, the probable earning capacity of the property under particular rates prescribed by statute, and the sum required to pay operating expenses, are all matters for consideration, and are to be given such weight as may be just and right in each case. We do not say that there may not be other matters to be regarded in estimating the value of the property. What the company is entitled to ask is a fair return upon the value of that which it employs for the public convenience. On the other hand, what the public is entitled to demand is that no more be exacted from it than the services rendered it are reasonably worth.

Although Smyth vs. Ames is taken as the comprehensive basis for valuation methods which may have general application now and in the future, it is important to note that for present or immediate use it is specifically affected by more recent decisions.

The basic case, Smyth vs. Ames, was decided about 30 years ago. For the next fifteen years the cost of construction rose so slowly and so uniformly that the reproduction cost did not vary sharply from the original cost of property constructed within that period. A similar condition has existed for the past eight years. There may be longer periods in the future when original costs and reproduction costs will be virtually the same. And in the future also, under commission regulation, it may be feasible to ascertain original costs with a greater degree of accuracy than in the past. But if part of the property was constructed or installed before the war and other parts during or after the war there can be no direct comparison between original and present costs as expressed in the dollars of their respective times. Later decisions are consistent with Smyth vs. Ames.

As to the request for a formula, and for the weight

to be given present reproduction cost, the Supreme Court has clearly stated that there can be no formula, and that reproduction cost has controlling but not exclusive weight in the reasonable determination of the present fair value which must be taken as the rate base. There seems to be no need for any further rule. With the radical change in money values caused by the war, it does not appear how any reasonable interpretation of Smyth vs. Ames could arrive at a different conclusion.

The slow and laborious part of finding present value is taking the inventory. This work could be placed by the commission on the utility, where it belongs. The pricing of the inventory by the commission staff and the finding of fair value by the commission should involve but little time and expense. Where the inventory already has been taken, as in the case of the steam railroads, it is simpler to affix the present unit prices for the entire property, and thus obtain an approximate basis for present fair value, than to apply pre-war prices on part of it and various other prices on other parts, with a final result clearly out of harmony with the legal requirements of the situation.

It should be noted that while the legislative branch establishes rates it looks to the judicial branch for the rule of valuation on which those rates are based. Thus in the Transportation Act of 1920, supplementing the Interstate Commerce Act with nineteen paragraphs designated as Section 15a, paragraph 4 provides as follows: (1) it requires "due consideration to all the elements of value recognized by the law of the land for ratemaking purposes"; (b) warns against giving undue weight to the property investment account or original cost; and (c) finally directs that "the value so ascertained shall be deemed by the commission to be the value." It does not attempt to prevent review by asserting that the courts shall deem it to be the value.

Notwithstanding that the steam railroad inventories already in the files of the Interstate Commerce Commission could be quickly priced and extended to afford a basis from which to find the present fair value, the commission early in 1930 recommended to Congress a complete revision of Section 15a to obviate finding the value by the above method, and a bill has been introduced in the Senate for that purpose. The proposed revision contains a feature hardly less important than the process of valuation. It provides that such part of the excess earnings of the prosperous roads as under the present act may be applied by government to the aid of the weaker roads shall be used by the prosperous roads themselves for extensions, improvements and reduction of debt. This constitutes a rich concession to some of the Class I railroads. It may induce that group to reach a compromise with the commission which would preclude appeals to the Supreme Court. But for the other railroads and for public utilities in general it does not appear that the valuation laws as hitherto interpreted by the courts could be affected materially by the new method.

The proposed revision omits going concern value, an element almost universally recognized as part of the valuation for rate-making purposes. The decisions declare that it always exists but is hard to measure. To set it at zero is a genuine innovation. In the attempt to measure it, the first body rendering a decision has a certain advantage, as was strikingly expressed by that brilliant lawyer and tactician, the late Judge C. A. Prouty, in an argument before the Interstate Commerce Commission on Jan. 7, 1930, speaking as director of the valuation bureau:

> Going value might be even more difficult. How are you going to determine what shall be added? The fact that a thing is difficult does not excuse you from attempting to do it and you also enjoy this advantage, that if you will just simply *do* it, without undertaking to say precisely how you did it, nobody can ever find any fault with it. That will absolutely end it.

The advocates of the "prudent investment" theory assert that once the valuation is determined by that method it can easily be kept up to date by accountancy—showing the net property additions and deductions from time to time. That is probably true. It certainly is true while construction costs continue the even tenor of the last eight years. But this condition is not a function of "prudent investment." It is entirely independent, and prevails to the same degree if the valuation be by the present inventory method. In fact, it is all very easy and simple, except finding the first valuation in those cases where the rate-making bodies insist in effect that pre-war dollars and present dollars are the same.

John W. Burke

THIS STUDY and the one on depreciation to be published in a forthcoming issue are based on Mr. Burke's experience of about ten years in the valuation of utility and industrial properties, and that in turn on more than fifteen years experience on their construction.

Following graduation in the civil engineering course at Worcester Polytechnic Institute, Mr. Burke was engaged four years as an assistant engineer, and during the next ten years he was successively chief engineer on the design and construction of several properties including railroads, electric railways, dams, power plants, wharves, warehouses, municipal water supplies, sewers and pavements. He also had architectural experience.

For a number of years he was on the staff of large engineering organizations as a consulting engineer and superintendent of construction on public utility and industrial properties. He also examined and reported on numerous engineering projects and existing properties in this country and abroad, and prepared estimates of their costs and earnings. As president and general manager he operated an urban and interurban electric railway for six years.

Frequent Valuations Not Necessary

An outstanding misconception is the idea that under the "present fair value" method frequent valuations are necessary on account of the constant fluctuation in prices. As a matter of fact, the ordinary undulation up and down leaves the net value substantially unchanged unless or until a new plateau of costs is clearly established. Generally speaking, there are only three causes for a valuation. First, an improper rate in the beginning; second, a substantial change in net revenue from operation; and third, a cataclysm resulting in a radical change of currency. Valuations are not, and cannot be, so refined as to correct for lesser aberrations than these. "Prudent investment" would avail not.

In the older utilities the rates adopted at the beginning were sometimes haphazard for lack of experience. On this rather accidental method the 5-cent car fare was adopted. And it happened on the average to be fairly satisfactory until the World War reduced the old 5-cent fare to about 3 cents. But there were many special cases where power costs, length of haul, density of population, plan and topography of the city, varied widely from the average, and in some of these cases attempts to change the fare necessitated finding a valuation for the first time on the property in question.

Changes in net revenue result, of course, from variations in patronage and in costs of operation. These in large volume seldom occur suddenly, but throughout a series of years may become so substantial as to require redress.

The third cause—great changes in the value of money—occurs most infrequently. The world has witnessed only two major phenomena of this character in more than 100 years, those due to the wars of Napoleon and to the recent World War. The Civil War in this country was another event of the same kind, but not of world-wide influence. The belief is groundless, therefore, that changes in currency require frequent valuations, and that this could be obviated by the "prudent investment" method.

There are two other important influences on money values, but these operate so slowly as not to necessitate frequent valuations. First is the increase or decrease in gold supply. Second is the economy resulting from mass production. Thus the only sudden change in money value is due to a great war. Once that is settled an early displacement of values need not be expected. A valuation properly made after the currency has reached a new and fairly steady level, need not be remade in the near future.

The present fear of frequent valuations probably was induced by recent experience in abnormal times, when we witnessed in numerous cases two or more valuations of the same utility within ten years from the beginning of the war. The reason we have had more than one valuation from World War conditions is that we did not accurately discount these conditions. In 1918 it was generally estimated that post-war costs would stabilize at about 40 per cent above pre-war, whereas the increase has been double that, and in 1920 was even more. Despite the teachings of history, many of the courts and commissions refused to make adequate allowance for the new currency, and some of them cherished the delusion that pre-war costs were the eternal standard to which we must shortly return. Early official valuations based on these errors had to be corrected by subsequent ones.

Although a valuation properly made, after the currency is stabilized, can be kept approximately up to date for many years by accountancy under engineering direction, it should not continue indefinitely without a revaluation. Constant minor fluctuation in prices may in the course of years result in a substantial net change above or below those prevailing when the valuation was made, and there likewise may be an accumulative error in the new property accounts. Just as there is an ill-defined twilight zone between maintenance and depreciation, there often is a doubt as to the exact capital charge in retiring elements of property. The only accurate check is a revaluation, which automatically corrects the inventory, the change in costs, and the errors in accountancy judgments.

To arrive at "present fair value" under our law, depreciation must be considered. Although it seems illogical to deduct accrued depreciation from the fair cost of a public utility to find the rate base, the principle has been so well established by decisions that it must be accepted. In theory, a public utility property is dedicated to the service of the public. That property is the investment, which should be kept intact and uniform by maintenance and replacements, comprising part of the operating expenses paid by the public served. It seems inconsistent that any accumulation of these operating expenses should be deducted from the capital investment, and that thereby an amount be arbitrarily taken from the investor without any fault or omission on his part.

But as the courts direct that the utility valuation shall add for actual appreciation of the property, they require also that actual depreciation shall be deducted. Presumably this legal consistency is wise and prudent. It may be asserted that it has a further justification as applied to public utilities. It may be in the interest of a sound public policy that even a property that can collect no depreciation from its patrons be charged with a nominal amount of accrued depreciation as a spur to keep it in good operating condition; so that a property with deferred maintenance, from any cause, would not be allowed its full investment. It should be remembered that exact justice seldom can be had here below; substantial justice is all that may be expected.

It is positively stated by the Supreme Court in the United Railways & Electric Company of Baltimore vs. Harold E. West et al., Jan. 6, 1930, that depreciation, like the rate base, must be predicated on present value, and not on the so-called cost, meaning the cost expressed in dollars of the time of construction or installation. From the decision it is clear that depreciation is an operating expense. It should not be deducted from the rate base except for the special reasons hereinbefore stated. In any event, the depreciation fund is not intended to restore the property to newness. The Baltimore decision twice states that the purpose is "to maintain the level of efficiency for the public service."

Finally, the Supreme Court in the Baltimore case completes the logical requirements of equitable rate making by providing for some surplus earnings, which are necessary to maintain the financial credit of any industry, public or private, and which are dictated by sound business management.

Commission Regulation Practicable

It has been charged that regulation of public utilities by commission has failed. As well might we say that it has not been tried. From the recent report of the New York special legislative committee and from other evidence the public begins to realize that the problem of regulation is not merely one of good business judgement and legal knowledge, but is largely technical. This latter character has not been recognized sufficiently, and as a natural consequence only a small proportion of the commissioners were appointed for their technical training, and the commissions generally have not been clothed with the authority, or provided with the necessary funds, to procure an adequate engineering staff.

In many of the states it has been customary to select the commissioners from men prominent in public life. They are thus likely to possess tact, patience and knowledge of human nature, all indispensable qualifications, which, however, may be found in others who in addition

are equipped by special training to cope more effectively with questions of valuation and rate making. It would be a long step forward if the commission in its entirety had not only a good knowledge of law, but also of economics, of engineering and of finance; and if each of its members were proficient in three, or at least two, of these subjects. In an efficient regulatory body, quality also extends to the staff. It is small but select.

By far the most valuable work of a trained commission and staff would be to reassure the public. Prompt, open and clear decisions by a commission of eminent attainments would soon dispel all public doubt and suspicion. Another and hardly less important result would be that such a commission automatically would find itself in harmony with the law of the land on valuation. The dangerous discontent with many of the court decisions would cease when people discovered that there was no conflict between court and commission.

As might be expected, the Supreme Court, ever eminent in ability and experience, has developed and stated the clearest principles of valuation. These are in best accord with the views of experienced engineers and students of the subject. Of late we sometimes hear it suggested that the problem is economic rather than legal, and that therefore it is more reasonable to expect its proper solution by the commissions than by the courts. It is true that the commissions should conclude the matter and not leave it to the courts. But to accomplish this it will be necessary for some of the commissions to conform to sounder principles of valuation.

Combination Traffic and Warning Signal Used at Salt Lake City



Vehicular traffic is warned of the approach of an electric car by flashing lights in this signal installation at Salt Lake City

VEHICULAR traffic control and warning of the approach of electric interurban cars are dual functions of a novel signal installation made at Salt Lake City, Utah. The double track of the Bamberger Electric Railroad on Jennings Avenue crosses Second West Street at right angles. Because the latter street is 80 ft. wide between curbs, it was felt that a pipe standard at one side would be too much out of the line of vision. The municipal authorities would not permit the installation of a safety island in the middle of the street on which the flashing red projectors might be mounted on a pipe standard, as is usual in crossing signals. For this reason, four projectors were suspended between two messenger wires stretched across the street, one pair facing each direction. The units of a pair are 30 in. apart and are mounted adjustably on gimbal suspensions, so as to direct the concentrated beam most favorably upon the automobilist. These red projectors are 9⅜ in. in diameter with glass parabolic mirrors and 50-watt concentrated filament lamps. A traffic signal, of the four-way two-deck type with red and green lenses, is suspended above the center of the intersection, showing normally red to the railway and green to the traffic on Second West Street. Starting contactors are located above the track 400 ft. back of the intersection, with stopping contactors just on the far side of the street.

An electric train, approaching the crossing and passing under the starting contactor for that direction, throws the normally red traffic signal in the sight of the motorman to green, which indicates that the signal on Second West Street has been changed from green to red, stopping traffic on that street. At the same time, the red flashing projectors, which were hitherto dark, begin to flash alternately to indicate that a train is approaching the crossing. As soon as the trolley wheel of the electric car passes under the stopping contactor, beyond the crossing, the indications are thrown back to normal.

The lights and flasher relay are fed from a 110-volt alternating-current circuit, while the latch relays are operated from the 750-volt direct-current trolley. Separate relays are provided for each track, with their contacts in series for the red indication to the railway and in multiple for the green indication and the flashing lights. Thus a train quickly passing on one track will not stop the warning for a train approaching slowly on the other track.

ARTICULATED CARS Tested

Two types of four-axle cars built in three sections, have been developed for street car service in this important German city. The methods used for supporting the bodies on four axles differ widely in the two designs, which were worked out in collaboration with the railway officials

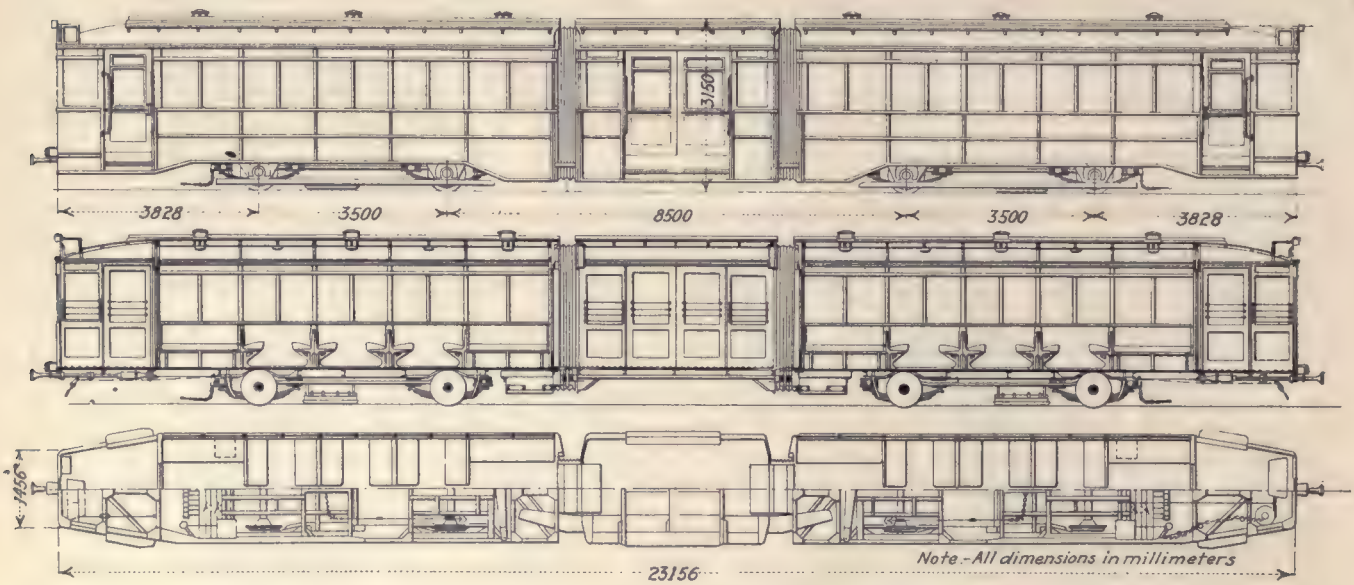
GROWING street trailway traffic in Germany has caused a demand for large-capacity street cars, similar to those used extensively in American cities. This demand has led to the development by the management of the Dresden municipal railway system, in co-operation with two of the leading car builders, of two types of three-unit articulated trains which have a number of novel features.

One of the trains, built by the firm of Christoph & Unmack of Niesky, with electrical equipment by the Sachsenwerk of Niederseidlitz, comprises two single-truck car bodies with a third suspended between them by an articulated coupling. Each of the end sections has a seating capacity of 30 persons and standing room for six more. The central section has room for 30 standees and each end platform for 8 standees. The capacity is 60 seated and 58 standing passengers, a total of 118.

Extensions of the center sills of the middle section rest in articulating bearings in the end sections, which



The articulated car made by the Christoph & Unmack firm has two motor sections supporting a center section



Floor framing of the Christoph & Unmack car, showing method of supporting the center section

in Dresden

are carried on springs. The horizontal pull is taken on a coupling bolt which is carried in a swiveling bronze bushing. Vertical forces are transmitted through spring-supported roller bearings running on rails in the end section so as to damp out oscillations.

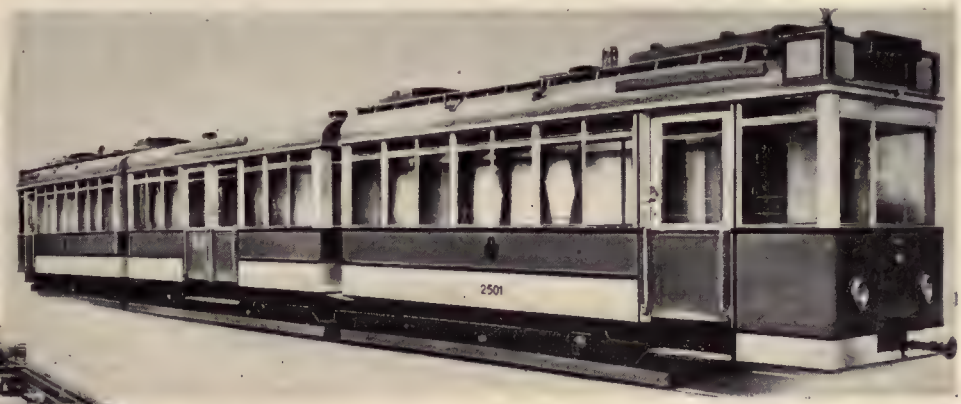
The end units are of the two-axle type without trucks, built, in general, according to standard German practice. Each wheel is supported by a leaf spring, each end of which is carried in a shackle with a spiral spring, making a three-point suspension and said to give very smooth running.

The underframing is built up of steel sections, joined with gusset plates and struts. The side frame is built according to a patented design known as the Niesky hollow-post construction. The posts are made of U-sections with reinforced flanges, while the carlines and connecting members are pressed steel. The sheet steel siding is formed into pockets for receiving the connecting bellows at the abutting ends of the bodies. The arch-type roof is covered with waterproof duck.

The double entrance doors are sliding, running in ball bearing tracks, and are geared to open simultaneously. The passageways between the sections are made of overlapping steel plates, and the bellows inclosing the sides are of leather covered with duck.

There are three independent braking systems on the car. The service brake is of the dynamic type, in which the car motors are short-circuited through suitable resistance. There is a hand brake of the toggle type acting on all axles. The new feature is a magnetic rail brake of the Jores type. To improve the braking action on slippery rail there is a sander which can be operated by hand from the motorman's position or automatically. The electromagnetic control of the sanders opens the release valve when there is an emergency application of the short-circuit brake or any application of the magnetic rail brake, which is intended for emergency stops only.

Four propulsion motors are used, one on each axle.



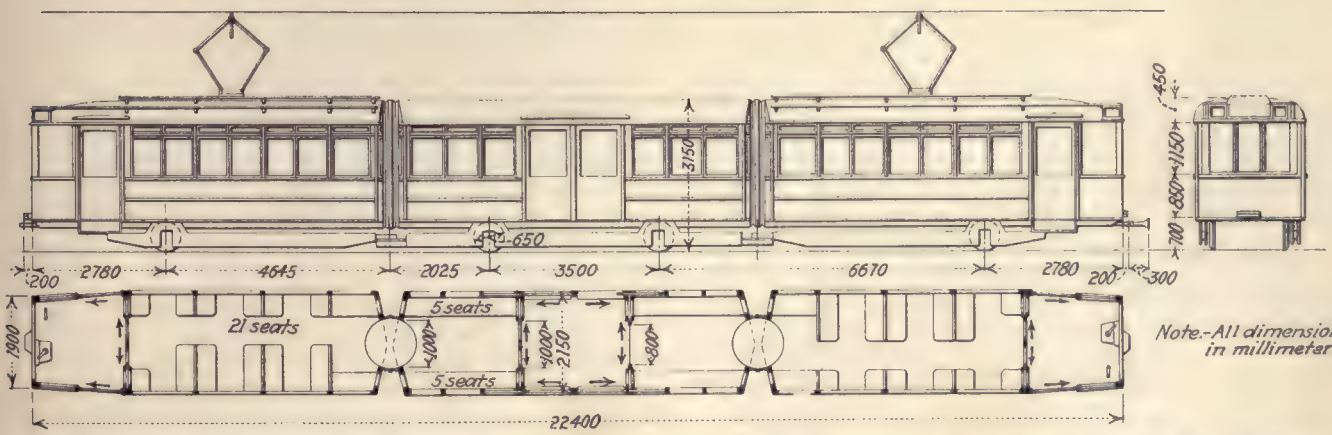
The articulated car furnished by the Waggon & Maschinenbau is of similar appearance to the other, although the construction differs radically

A two-wheeled truck carries each outer section of the Waggon & Maschinenbau car. Its inner end rests on the four-wheeled truck under the middle section



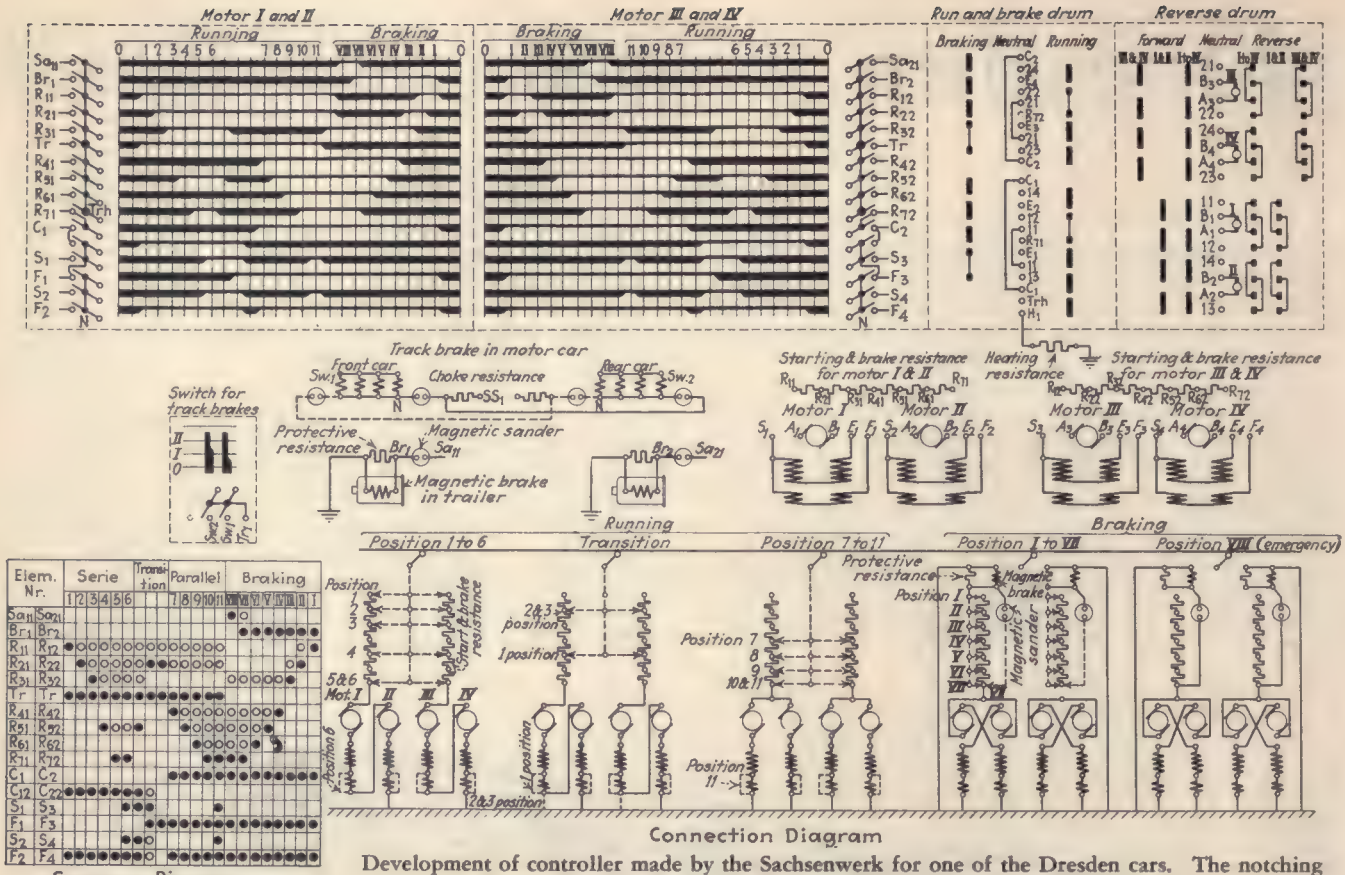


The truck of the middle section carries supports at its ends on which rest extensions of the end trucks



Note.-All dimensions in millimeters

The method of supporting the car from a center truck and the two-wheel trucks of the end sections may be seen in the diagram



Development of controller made by the Sachsenwerk for one of the Dresden cars. The notching drums cause fingers to be depressed, closing the appropriate circuits

Each motor has a one-hour rating of 33 kw. at 550 volts d.c. and 800 r.p.m. Although the wheel diameter is only 650 mm. (25½ in.) the over-all height of the motors was kept small enough to give satisfactory road clearance and clearance between the motor and the car floor.

Since the train consists of three separate sections, and is arranged for double-end operation, it was necessary to carry the power and control wires from one end to the other. They are placed in cable ducts in the roof, terminating in connection boards at the ends of the units. Connections are made with extra flexible cable jumpers between the end and center sections.

Platform control for the motors was specified. On account of there being four relatively large motors grouped in two units, and as it was desired to be able to control each of the motor sections by itself, double-drum controllers were installed. The controllers have two interlocked drums rotating together, each drum handling the pair of motors in one section. Separate starting and braking resistances are installed for the two groups of motors. In order to make the controller approximately as easy to operate as a standard series-parallel controller, a notching type drum was adopted, in which the connections are not made directly by the pressure of the fingers on the segments, but in which the movement of the fingers opens or closes contacts pivoted to them. The one controller can handle either the two motor car sections together or one alone.

The dynamic brake for normal service is controlled by the same controller as the power. The brake circuits for the two pairs of motors are also independent, so that if one motor fails, half of the dynamic braking effort is obtained. Each magnet exerts a pull of 4,500 kg. (9,921 lb.).

Emergency braking is done with four rail shoes, with electromagnets of the Jores type. These brakes are attracted to the rails and are fed with line current. The brake controller is alongside the main controller, although not interlocked with it. The switches are so arranged that the magnets on the rear section are set first, obviating surges from having the rear section of the car strike the forward ones. When the track brakes are operating, a bell fed with line current continues ringing, so as to warn the operator not to keep the brake on longer than necessary.

Other equipment of the car is standard. The starting and braking resistors are mounted on the roof, and current is supplied through Fischer-type pantographs.

Construction of the other articulated car differs considerably from that described. It was built by the Waggon & Maschinenbau A. G. of Görlitz, and the elec-

Principal Dimensions of the Two Dresden Articulated Cars

	Christoph & Unmack			Waggon & Maschinenbau		
	mm.	ft.	in.	mm.	ft.	in.
Length over dashers	23,156	75	11⅛	22,400	73	5⅞
Length over couplers	24,166	79	3⅛	22,800	74	9⅛
Length of end compartment	7,300	21	11⅛	5,465	17	11⅛
Length of middle compartment	4,000	13	1⅛	7,390	24	2⅛
Length of end platforms	1,928	6	3⅛	1,880	5	11
Maximum width	2,200	7	2⅛	2,200	7	2⅛
Width over side sheathing	2,116	6	11⅛	2,150	6	10⅛
Height, rail to car roof	3,150	10	4	3,150	10	4
Height, rail to car floor	700	2	3 1/16	700	2	3 1/16
Height of first step	395	..	15⅝	380	..	14 15/16
Height of second step	305	..	11 15/16	320	..	12⅝
Track gage	1,448	4	9	1,448	4	9
Diameter of driving wheels	650	..	25⅝	650	..	25⅝
Rigid wheel base	3,500	11	5⅜	3,500	11	5⅜
Distance, coupling center to center of wheelbase	4,000	13	1⅛	4,645	15	2⅞
Distance between coupling centers	4,000	13	1⅛	7,550	24	5⅛
Weight of train complete, kg. or lb.	28,000		61,730	28,000		61,730
Number of seats	60			62		
Number of standing places	58			55		
Total passenger capacity	118			117		

trical equipment was furnished by the Siemens-Schuckert Werke of Berlin. In this car the center section is mounted on a four-axle truck, and the end sections are mounted on two-axle trucks, the inner ends of which rest on extensions of the middle truck, being joined with articulating couplings. The three sections are of approximately equal length, with double sliding doors in the center section. Each end section has seats for 21 passengers and standing room for three in the body, as well as eleven standing places on the end platform. The middle section has seats for twenty and standing room for 27, making altogether 62 seats and standing room for 55, or a total of 117 passengers.

The electrical equipment of this car consists of four motors of 38 kw. one-hour rating at 850 r.p.m. The control is similar to that of the other car, including dynamic braking for service and a magnetic rail brake for emergencies.

Principal dimensions of the two cars are given in the accompanying table.

Selection of Motor Controls

Depends on Circumstances

By R. S. BEERS
Transportation Engineering Department
General Electric Company, Erie, Pa.

WHEN selecting a type of control, an intimate knowledge of the work to be done, the scope of the control and the limitations of the operator, physical and otherwise, are essential. For instance, on a bus that must be steered, a control that is actuated by hand is not as desirable as one that is actuated by the foot. On the other hand, if there are few stops and little traffic, a hand control is simple and may be very successful.

One of the first considerations of controls is whether it be automatic or non-automatic. With the former the operator's work is reduced to the minimum, and the most of the control functions are predetermined, fixed and unchangeable; with non-automatic control success depends largely on skillful and intelligent manipulation.

Non-automatic control should preferably be used where the train weights vary through a wide range, such as with an electric locomotive which must run by itself as a unit and also when coupled to a heavy train. Automatic control is preferable where a number of similar units make up a train, as for motor equipments on subway, elevated and suburban electric trains.

With single cars in city streets, both types of control are successful. The majority are the simple non-automatic K type drum control. Trolley bus controls abroad are generally non-automatic, while in this country both automatic and non-automatic are in successful use. The selection of automatic control for trolley buses was made largely to relieve the operator of as much mental and physical labor as possible. Incident to this, on trolley buses, the foot is preferable to the hand for operation of the controller. This, in turn, leads to the automatic type which requires only pressing a lever to obtain smooth acceleration. The non-automatic type requires a pause on each controller notch, which is not as easily done with the foot as with the hand because the feet are not trained for such nicety of action.

Success of automatic controls depends on a governing influence, the one commonly used being a combination of motor current and time. A system control governed by current alone, if arranged for a level road, would probably make the acceleration too slow on a hill; or, if arranged for the hill, it would be too fast and jerky on the level. Likewise, if time alone is used, there is no limit to the abuse that the motors may receive. Fortunately, a combination of the two is a successful arrangement. Modern transportation vehicles, with accelerating rates as high as passenger comfort will permit, require a control that normally accelerates on time but is prevented from exceeding a safe motor current value. So long as the acceleration rate can not be tampered with by the operator, one is sure of always starting the vehicle at a high rate, which in frequent stop service is one of the essentials necessary to maintain a high schedule speed. Today we talk high accelerating rates, 3 m.p.h.p.s. being the value most frequently used, while formerly it was 1.5 m.p.h.p.s. Actually, our motormen on city cars with K controllers have been increasing the accelerating rates to maintain their running time. A survey covering the United States brought out that the average time for turning a K controller "full on" was seven seconds, but, in a number of cities, it is done in four and five seconds. Translated into average accelerating rates, this gives values of 2 to 2.5 m.p.h.p.s. When the average accelerating rate exceeds 2.5 m.p.h.p.s., it is necessary to have more notches than are included in the usual K controller in order to obtain smooth and comfortable acceleration. It is obvious that the more notches used, the smaller the current changes will be when each section of resistance is cut out. This has a twofold value, as it insures comfortable acceleration and, at the same time, reduces the likelihood of wheel slippage.

The best control for fast acceleration is automatic in action. So long as the acceleration rate is high and constant, this insures the quickest getaway. Where the acceleration rate is selected by the operator, there is no valid reason why a simpler, non-automatic control with sufficient controller notches should not be used.

The modern fast acceleration control is compact and easily installed under the car or in a cabinet inside the car or bus. Controls of this type are in successful use on either cars or buses in large cities like Chicago, Baltimore, and Brooklyn, as well as others such as Albany, New Orleans, Salt Lake City, Youngstown and Knoxville.

Aluminum Frame

Reduces Railway Motor Weight

MORE than a year ago the Westinghouse Electric & Manufacturing Company inaugurated plans for reducing the weights of heavy electric railway motors, particularly single-phase motors. It was realized that, where possible, use of light-weight materials would make a considerable saving in weight if substituted for steel or iron. As a result of conferences with the engineers of the Aluminum Company of America, it was estimated that savings of 600 to 1,000 lb. would be possible on a 200-hp. single-phase motor of the type commonly used on the Pennsylvania Railroad; New York, New Haven & Hartford; New York, Westchester & Boston; the Reading Railroad, and similar installations. This was found possible because the motor shell in single-phase machines is not a part of the magnetic circuit. Beside the frame, it was found possible to make end housings and axle caps of aluminum. Similar parts have been in use on an experimental car of the Cleveland Railway for some three years.

In order to make a satisfactory motor shell, it was necessary to develop an aluminum alloy casting which in strength would compare favorably with the cast-steel frame now generally in use. The first frame was cast in aluminum alloy from a pattern made for cast steel. The motor case of aluminum alloy weighed 553 lb. as compared to 1,295 lb. for the steel casting from the same pattern. It was, however, necessary to test the aluminum frame under conditions approximating those of actual service. Accordingly, the Aluminum Company set up the castings on an improvised car axle, with the motor nose centered as in service and dropped weights from various heights on to the middle of the shell. The steel frame was tested first with a 1,000 lb. weight dropped 2 ft., 3 ft., 4 ft., 5 ft., 6 ft. and 7 ft., with no resulting indications of failure. The first aluminum frame failed when the 1,000-lb. weight was dropped 4 ft., by breaking out of the nose from the main frame. With the information thus determined at hand, the frame was redesigned, certain parts being increased in cross-section and others diminished. The new frame which was cast withstood the 1,000-lb. weight dropped from heights up to 7 ft.

Not satisfied with this performance, the test was continued, a 2,000-lb. weight being dropped on the steel frame up to a height of 7 ft. at intervals of 1 ft., with no disturbance of the steel structure being evident. The second aluminum casting was then subjected to the 2,000-lb. weight and could not be fractured by it when dropped up to the 7-ft. height. It was not considered necessary to carry the test further, as the stresses existing in the frame when the 2,000-lb. weight was dropped 7 ft. were greater than could possibly be encountered in service. Furthermore, it was considered that other parts of the motor, its mounting, the parts of the truck to which the stresses must necessarily be diverted, were considerably weaker than the frame. The Westinghouse engineers considered the aluminum frame to be entirely suitable for railway service. Plans are now under way for the introduction of test equipment of the aluminum-equipped single-phase railway motors, to obtain actual service runs.



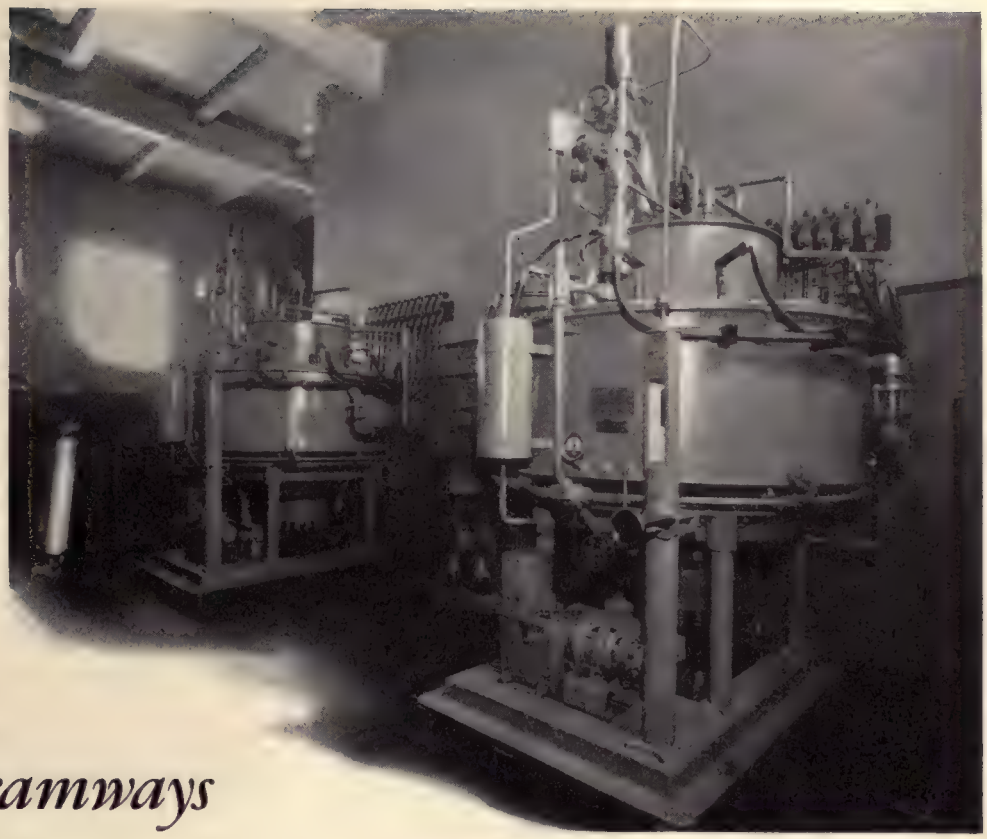
Frame for single-phase railway motor of cast aluminum alloy, which weighs only 40 per cent as much as the steel casting it replaces

By the redesign of the castings, in connection with the new alloy used for its manufacture, the weight was reduced to 533 lb. as compared with the steel castings of 1,295 lb., or a net saving per frame of 762 lb. This reduction in weight should prove a material factor in the design of future single-phase motors. It is understood that the Westinghouse Company is prepared to offer these motors with aluminum frames, end housings, axle caps, spiders, and similar castings. Direct-current motors, in which the frame is part of the magnetic circuit, are being built with aluminum end housings, axle caps and similar parts. Since the substitution means a considerable reduction in unsprung weight, it is believed the change should be attractive.

P.L.M. Gets Heavy Locomotives

NEW electric locomotives placed in service on the French Paris-Lyons-Mediterranean railway a few months ago and operating between Chambery and St.-Jean-de-Maurienne, near the Italian border, have demonstrated a remarkable hauling capacity, according to a report to the Department of Commerce by Trade Commissioner Louis Hall, at Paris.

Over comparatively heavy grades these locomotives can haul trains of 600 tons at a speed of approximately 55 m.p.h., while along other parts of the line trains of more than 800 tons have attained speeds of from 60 to 66 m.p.h. These electric locomotives are said to be twice as powerful as the most powerful steam locomotives of the "Mountain" type operated over the P.L.M.



In the Viau substation the two 12-phase, 1,500-kw. rectifiers convert power from 60-cycle alternating current to 600-volt direct current

Montreal Tramways Installs Third

Automatic Rectifier Substation

Following the successful use of mercury arc rectifiers with full automatic control for more than three years, the Montreal system continues the expansion of its power supply with similar equipment, but with many distinctive features

By

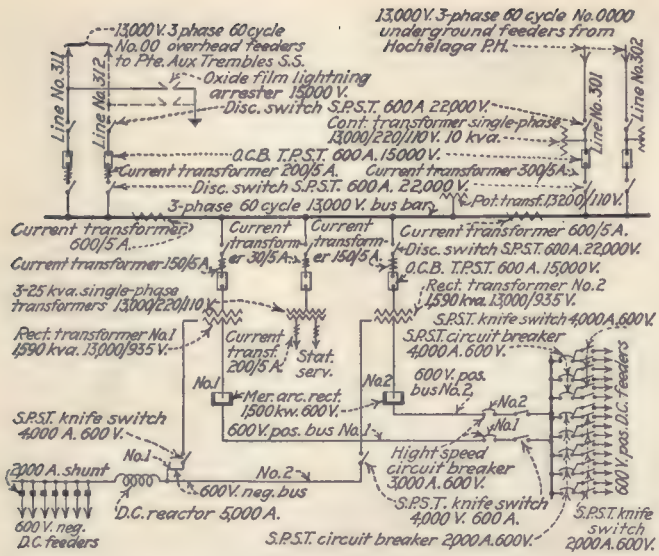
M. L. de ANGELIS
Assistant Electrical Engineer
Montreal Tramways, Montreal, Canada

SINCE the first installation of mercury arc rectifiers was made by the Montreal Tramways in the Verdun substation in February, 1927, the results have been followed with great interest by the management. This installation, which formed the subject of an article in ELECTRIC RAILWAY JOURNAL for April 30, 1927, was followed the succeeding January by a second rectifier station at Rockfield (see the JOURNAL for August, 1929). These installations have been so successful from the points of view of reliability maintenance and operating costs that the company decided to extend the use of this type of converting apparatus and to install it in the new Viau substation. This third station began operation on April 10 of this year.

Construction of this station was necessary to take care of increased traffic in the eastern districts and to replace another one the equipment of which had become inadequate and somewhat inefficient. Moreover, due to the change in the load center of the sections fed by the old station, the latter was no longer correctly situated for minimum direct-current distribution losses. It was, therefore, decided to locate the new station further east, where several important converging lines have track loops.

In the main the building is similar to that of the Rockfield Station, the approximate over-all dimensions being 52 ft. 6 in. by 36 ft. 1 in. by 32 ft. high, the volumetric density being 20.2 cu.ft. per kilowatt. It is of brick with a concrete basement carefully waterproofed. The building is entirely fireproof. The roof is of Aerocrete slabs covered with Celotex mastic cement 1 in. thick. The high-tension oil circuit breaker and busbar cells are of concrete and situated along one side of the main room, while the rectifiers are on the other side.

The control switchboard room is on the same level as the rectifier room, without any separating wall between, as shown in the plan. This layout has given the advantage of using one side of the control room for the



One-line schematic diagram showing the circuits of the Viau rectifier substation of the Montreal Tramways

high-tension cells, reducing to a minimum the total length of the building. The bake-out transformer is between the two rectifier tanks on a small foundation against the longitudinal wall. All the high-tension compartments are provided with removable asbestos doors.

The rectifiers rest on the floor without any special foundation, and the floor of the transformer compartments is laid directly on the ground.

No lifting device has been installed above the rectifiers for maintenance purposes, because the heaviest part requiring inspection is the anode, which, with its clamping plate, can be lifted by two men without difficulty.

The basement contains a main room, a d.c. switchboard room, two small rooms for the incoming and outgoing high-tension feeders, a furnace room and a toilet. In the main room are the two fan-and-water-cooler sets, the three circulating water pumps, the water storage tank, the negative series reactor, the bake-out resistor, the control batteries, the transformer bank for station service and the negative feeder cable potheads and shunts. In the d.c. switchboard room are the rectifier and positive feeder panels, the high-speed circuit breakers, the shunt filters for attenuation of telephone interference and, in general, all the main d.c. conductors.

The transformer cells are at the side of the building nearest the rectifiers and are separated from the interior by a fireproof wall. They are roofed over but have a large front opening with Kinnear rolling steel doors and heavy wire screens. These doors permit easy removal of the transformers and provide air for cooling them. Louvers in the outside wall above the doors evacuate the hot air. In the roof of each cell a hook has been installed just above the transformer for lifting the core and windings by means of a chain block.

Ventilation of the basement and main floor rooms is obtained by means of two openings in the basement walls, equipped with horizontal shutters and screens. The hot air is discharged through two Robertson ventilators in the roof. The outlets of the fans for the water coolers converge to a vertical flue built into the wall between the two transformer cells. Solenoid-operated gates prevent the exhaust air backing into either of the two fans which may not be operating.

The electrical equipment, which was supplied by the Canadian General Electric Company. includes:

Two 1,500-kw., 12-phase, 600-volt steel tank mercury arc rectifiers with alternating-current ignition capable of carrying 150 per cent full rated load for two hours.

Two 13,000/935-volt, 60-cycle, delta/quadruple zigzag 3/12-phase transformers for the rectifiers and capable of the same overload as the latter.

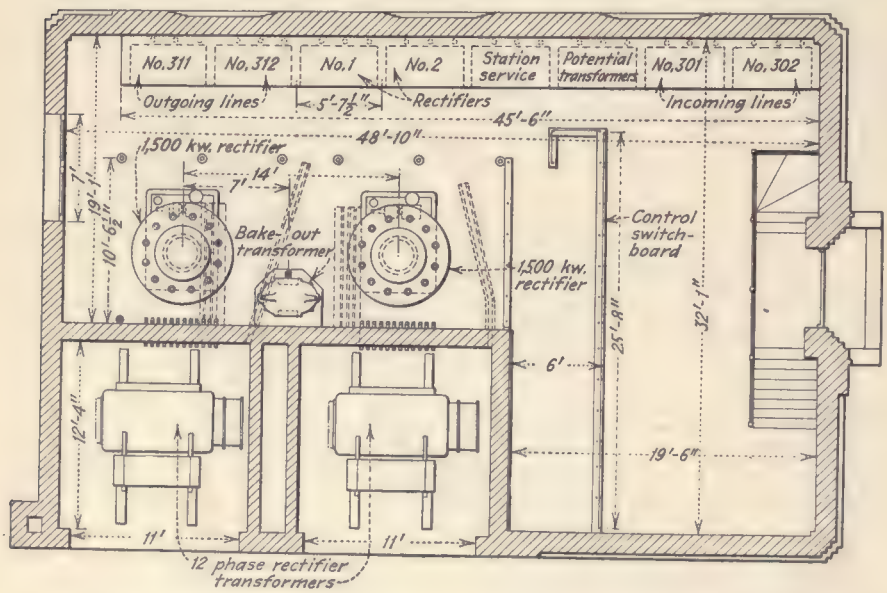
One 5,000-amp. series reactor rated to withstand 150 per cent load for two hours.

One bake-out transformer and resistors.

Two self-cooling systems for the circulating water required for cooling the rectifiers.

One complete automatic switching equipment for the operation of the following circuits:

Two incoming high-tension lines.
Two outgoing high-tension lines.
Two 1,500-kw. mercury arc rectifier units.
One station service transformer bank.
Three 4,000-amp. d.c. automatic reclosing feeders.
Five 2,000-amp d.c. automatic reclosing feeders.
One synchronous selector supervisory control equipment, and necessary storage batteries.



As in the previous rectifier substations in Montreal, the main apparatus and switchboard are on one floor, with the transformers in separate compartments

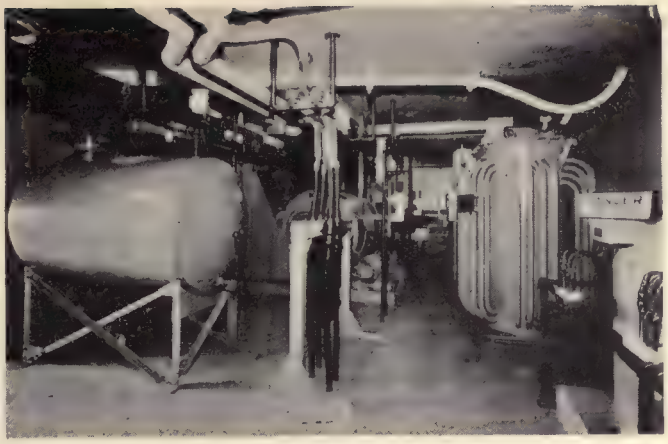
The outstanding novel features of the main apparatus are:

The mercury arc rectifiers, while generally similar to those in the earlier stations, have a number of different features. The tank proper with its associated devices is mounted on an insulated metal base with vacuum pumps, gages, water valves and other devices. The anodes are of graphite and are insulated from the tank by a special "micalex" insulator, which acts also as a vacuum seal. It has high mechanical strength, and its expansion coefficient is similar to that of the steel rod forming the terminal to the anode.

Anti-backfiring devices are mounted in the anode shields. Automatically controlled anode and tank heaters keep the rectifier at proper temperature under all weather conditions.

Each unit has its own water-cooling system, consisting of a blower,

radiator and pump for circulating the water. A water storage tank common to the two rectifiers supplies the make-up water should the city water fail for a long period. A third or spare pump is so arranged with valves that it may be used to replace either of the other two pumps. The fans operate only when the water has reached a temperature necessitating forced ventilation.



Auxiliary equipment, including water tanks and blowers and house transformers, are mounted compactly in the basement

The Langmuir mercury condensation pump is of the two-stage type, allowing the very low pressure to be obtained quickly in the rectifier tank. The cooling water for this pump is taken from the self-cooling system of the rectifier.

The approximate weight of the rectifier, together with accessories, is 8,000 lb.

Transformers for the rectifiers are of the outdoor, self-cooled type, with oil conservator. The three primary terminals are brought through horizontal bushings mounted on the vertical wall of the tank and located in an oil-filled junction box fixed to the tank. This box is provided with an oilproof stuffing box designed to receive the high-tension 3-phase cable feeding the transformer. The primary is connected in delta and the secondary in quadruple zigzag with the interphase transformers mounted in the main transformer tank. The complete transformers weigh 33,300 lb.

A bake-out transformer with adjustable load resistor is supplied for "forming" the rectifier tank after it may have been opened for a prolonged period. This method has proved to be simple and quick.

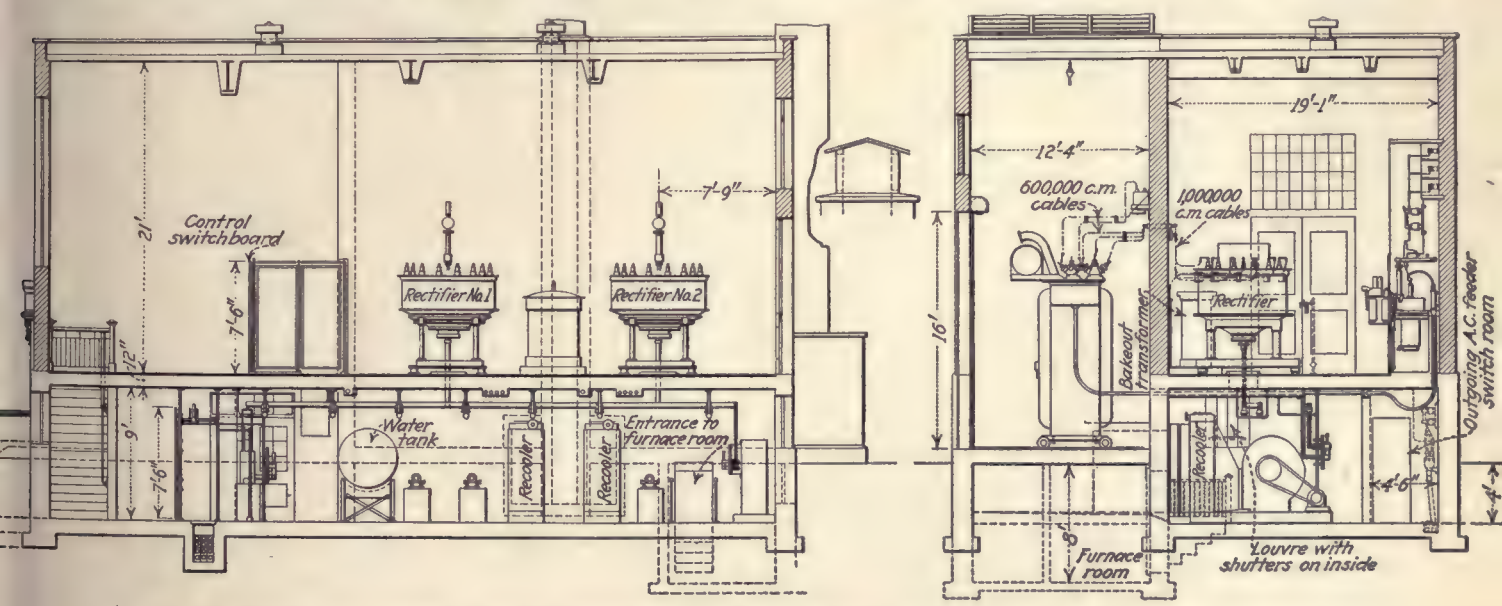
The automatic switching equipment of this station can function: (a) Completely automatically on load responsive impulse; (b) by supervisory control from the load dispatcher's office, or (c) manually from the switchboard in the substation. If operating automatically, the starting indication is given when the d.c. trolley voltage falls below a predetermined value, provided, however, that the high-tension supply has proper phase and voltage conditions. The sequence consists, as in all mercury arc rectifier installations, in establishing the excitation arcs, closing the high-tension breaker to supply a.c. voltage to the main anode and connecting the rectifier to the d.c. bus through a polarized high-speed breaker.

The second unit is started when the load on the first has reached a predetermined value for a definite time. Should the leading unit fail to start within a certain delay, the trailing unit is set in operation and replaces entirely the leading one. The trailing unit shuts down when the load on the station decreases sufficiently to be carried by one unit only, and the leading rectifier is stopped when the load has fallen below a suitable value, provided, however, that the d.c. bus voltage be above a certain amount.

The eight d.c. feeder breakers are self-reclosing and open on a given steady overload or on short circuit. They reclose on stub or multiple feed within a definite time if the load is not excessive.

The usual protective features for satisfactory rectifier operation are included in the automatic control. A throw-over switch has been included to cut out the automatic starting devices and, at the same time, to establish the excitation arcs. A pull-button switch allows the closing and opening of the high-tension rectifier breaker, and another similar switch controls the d.c. breaker. The a.c. over-current protection is retained under manual operation, and the vacuum regulation can also be operated manually, but the tank and anode heaters are always controlled automatically.

When the throw-over switch mentioned above is set for manual operation, the load dispatcher control is entirely cut out of service so as to eliminate all possibility of faulty and dangerous switching from the part of the dispatcher. He, nevertheless, receives proper indication



By the plan adopted this 3,000-kw. rectifier substation is held to small over-all dimensions without sacrifice of accessibility

the substation apparatus will be under the control of the load dispatcher located at Cote Street substation in the center of the downtown district of Montreal and adjacent to the company's head office.

The equipment is of the synchronous selector type and allows the dispatcher to perform the following operations at Viau substation:

1. Open and close—Two high-tension incoming line oil circuit breakers, two high-tension outgoing line oil circuit breakers, and one high-tension oil circuit breaker feeding the station service transformer bank.
2. Start, stop and release to automatic operation, the two mercury arc rectifier units.
3. Open and release to automatic operation, the eight d.c. feeder breakers.

At the dispatcher's office several indications will be obtained, namely:

1. Indication for the open and closed position of two high-tension incoming line oil circuit breakers, two high-tension outgoing line oil circuit breakers, one high-tension oil circuit breaker feeding the station service transformer, and eight direct-current feeder breakers.
2. Indication for the running, stopped and automatic position of the control equipment for the two mercury arc rectifier units.

The equipment at the load dispatcher's office consists of the control keys, indicating lamps, polarized relays and synchronous selectors for sending the control impulses and indicating the positions of the various supervised units.

The equipment at Viau substation consists of the supervisory devices, which transmit the control impulses from the dispatcher to the auxiliary control relays and send back indication impulses to the dispatcher. The panels are wired for 22 controls and indications, although only seventeen are actually used at present. Each supervised unit has, at the dispatcher's office, a key and lamp combination comprising a two-position control key, a red and green indicating lamp and a white lamp which signals an automatic operation of the corresponding supervised unit. Each combination has a two-position push-and-pull selecting key to stop the selectors at a point corresponding to the unit it is desired to control and an associated amber lamp to indicate when the selectors are connected to that particular unit. An alarm bell warns the dispatcher whenever the equipment has operated for any cause whatsoever. Exide storage batteries of 120 volts are installed, one at the substation and one at the dispatcher's station. They are of small ampere-hour capacity and obtain a trickle charge from Tungar rectifiers.

This supervisory system requires only four line wires between stations, but to provide for future developments telemetering, telephone and wire break-downs, a six-pair rubber insulated, lead-covering cable has been installed in the same underground duct line as the high-tension feeders.



High-tension breakers are mounted in individual cells with fireproof partitions



A close view of the direct-current feeder board in the Viau substation

It may be mentioned that a polarized high-speed circuit breaker has been installed between each rectifier and the positive bus and set to open in the reverse current direction. This breaker, by opening the circuit in less than 0.01 second, positively prevents damage to the anodes in the occurrence of a back fire, no matter of what material the anodes are built.

One unit was started on April 10 and the other on April 29 of this year. Since then the operation has been satisfactory and without any back fire. The station has delivered 1,131,500 kw.-hr. and been continuously in service, the two units having been in operation during 1,572 hours out of a total of 1,968 hours of elapsed time. One rectifier (unit No. 2) has been available for service throughout this period, while the other was, soon after it had been started, out of service for a few days, due to development of a leak in one of the high vacuum pipes which had been damaged during erection. However, this was easily and quickly repaired and the unit has been available ever since.

Cleveland Railway Has Contributory Pension Plan

Costs are shared by the company and its employees, and the risk is carried by two long-established insurance companies. Other pension plans summarized

CONTRARY to the customary practice of electric railway companies in providing old age pensions, the Cleveland arrangement is on a contributory basis and the risk is carried by two long-established life insurance companies. The company aids liberally in the support of the plan, and acts as intermediary in the collection of the monthly dues. This plan has been in effect since July, 1927. Prior to the adoption of the plan a complete analysis of accrued and impending liabilities was made by competent actuarial authorities.

Membership in the plan is voluntary, contingent upon at least six months of continuous service with the company, but approximately 95 per cent of the company's employees have availed themselves of its privileges. In applying for membership the employee simply fills out an application consenting to be bound by the regulations of the plan, and authorizes monthly deductions from his salary. The employees are divided into five classifications, based upon the rate of pay received annually, and dues are fixed in accordance with the following schedule:

Class	Annual Basic Rate of Salary or Pay	Amount of Monthly Dues
A	$1,500 or less	$1.50
B	1,501 to 2,100	2.50
C	2,101 to 2,700	3.50
D	2,701 to 4,500	4.50
E	4,501 and over	6.00

As the plan represents a co-operative effort between the members and the Cleveland Railway, provision has been made for joint representation on the committees which handle the details of administration. There is, first of all, a general committee of 34 members, representing the six major departments of the company. Each department is subdivided according to operating units or classes of employment, and each such unit annually chooses a member to represent it on the general committee. To be eligible for election as general committeeman an employee must have been continuously in the company's service for at least one year. Each of the departmental branches of the general committee selects a chairman, who serves as a representative of that department on the advisory committee. The advisory committee consists of these six chairmen, supplemented by six members appointed by the president of the company, the appointed members including the vice-president and general manager, the superintendent of personnel, the auditor, and the chief surgeon. From the membership of the advisory committee there is elected a chairman and a secretary of the committee. The advisory committee supervises the general work of the plan and determines questions of policy relating thereto.

Membership in the plan carries with it life insurance benefits under a group insurance policy, issued by the Travelers Insurance Company, the amount of which is based upon the member's period of continuous service. Beginning at $750 for those with service records of from six months to one year, the amount increases to $1,000 after the first year, after which it is increased $100 per year until the maximum of $2,000 is attained after eleven years of service. Membership also carries with it a supplemental $500 insurance policy which had been carried by the company at its own expense for several years before the present plan was adopted. Upon leaving the employ of the company the members are entitled to continue their policies in force with the Travelers Insurance Company without medical examination, at rates applicable to the member's then attained age and class of risk.

Should death occur through accidental cause, additional amounts of insurance are paid in accordance with a group policy carried with the Metropolitan Life Insurance Company, the amount for Class A members being $1,500, and for Class B, C, D and E members, $2,000. Under this latter policy, compensation varying from one-half to the entire amount is paid for certain specified injuries, such as loss of sight, loss of limb, etc., the provisions in general corresponding with those in the standard commercial accident insurance policy.

Under another arrangement with the Metropolitan Life Insurance Company, weekly benefits for loss of time due to sickness or accident are paid to the amount of $12.50 for class A members and $20 for classes B, C, D and E. These benefits continue for thirteen weeks and are supplemented in the cases of Classes B. C, D and E by weekly "occupational accident benefits" as provided under the Ohio state compensation law.

Retirement benefits, payable monthly for life, become available to members at age 65, if then in the company's service, after at least 25 years of continuous service. By mutual consent of the railway and the members of the plan, a member may be retired prior to the normal retirement date with a modified monthly benefit. Members who have reached the retirement age if they so desire and the company approves may continue at their regular occupations. Provision has also been made whereby the member at age 60 may receive a smaller retirement benefit, varying with the age of his wife, which benefit will be paid to his wife throughout her lifetime, should she survive him. Satisfactory evidence of good health is required of a member who desires to exercise this option.

Disability retirement benefits shall also become payable to members who may become totally and permanently disabled after at least twenty years of continuous service, regardless of age. These disability retirement benefits begin following the maximum payments of weekly sick and accident benefits and any total and permanent disability benefits which may have been paid under the group life policy.

The amount of the monthly retirement benefits is determined according to the number of years of service in each salary class. Monthly payments to members in

the various classes, following 25 years of service are as follows: Class A, $30; class B, $50; class C, $70; class D, $90, and class E, $120. This rate increases slightly with each year of continuous service to the members credit at the period of retirement, reaching a maximum in the case of a member who has 59 years of service. Forty years of service, for instance, provides monthly payments in the various classes as follows: Class A, $48; class B, $80; class C, $112; class D, $144, and class E, $175.

In establishing the salary classification for members with long records of service with the company at the time the plan was set up, the salary under which the member was employed on July 1, 1927, was used as a basis for determining the amount of his retirement and other benefits. If an employee changes from one salary classification to another, the retirement benefit will be the total of the benefit in one class, multiplied by the number of years in that class, plus the benefit of the other class multiplied by the number of years in that class, etc.

Upon leaving the service of the Cleveland Railway members have the privilege of exercising any one of three options with the Metropolitan Life Insurance Company in adjusting their retirement benefits. There is a cash surrender value amounting to from 21 per cent to 69 per cent of the total contributions made to the fund, a paid-up retirement benefit, requiring no further deposits and payable for life beginning at the normal retirement date, or there is the privilege of continuing to buy retirement benefits on the individual's own account at the then prevailing rate for such a service. In the event of death while in the service of the company the member's beneficiary receives the cash surrender value under the retirement benefit in addition to all benefits payable under the group life or accidental death clauses.

All members living in the Greater Cleveland area are entitled under the plan to avail themselves, when sick or injured, of the visiting nurse service provided by the Metropolitan Life Insurance Company. The nurse will, upon call, make at least one visit on every case, and will return as often as necessary upon instructions of the member's physician. Members are urged to communicate immediately with the nursing service with the view of minimizing the effects of any illness or injury.

Other Pension Plans

The pension plan of the Lehigh Valley Transit Company, Allentown, Pa., is conducted much along the lines of certain other companies, the details of whose plans were set forth in the August, 1930, issue of this paper. It has been in effect since July, 1913, and embraces all employees of the company. The pension paid is a flat sum of $20 per month, and is available after from 20 to 25 years of continuous service. No age requirement is specified. The expense of the plan is carried entirely by the company out of current earnings, and no reserve has been set up.

The company has never had an analysis made of its pension liabilities and costs and, with an increasing number of employees going on the pension list, is becoming apprehensive as to the future. The management, according to H. F. Dicke, vice-president, thinks that a pension plan is highly commendable, but is of the opinion that the employees should contribute to its support and that the company should take steps to accrue a necessary reserve.

Since November, 1901, the United Electric Railways of Providence, R. I., has had an old age pension plan in effect on its property. Open to all employees, it is available at age 70, without service requirements. The amount of the pension is based upon the average weekly pay for the last ten years prior to retirement. Payments are made out of current funds without the assistance of contributions from the employees themselves. No reserve has been accumulated. As the result of an analysis of its pension liabilities, the company anticipates difficulties in the future and has under consideration a revision of its present plan in order to reduce its cost, which is at present averaging approximately 1 per cent of the company's total receipts.

Under the proposed plan employees reaching the age of 70 who have served the company for 25 years would receive a pension of $40 per month, with an addition of $1 per month for each year of service over 25 years. In order to take care of special cases it is proposed that the company may, at its discretion, retire with pension any employee who has reached the age of 65 years and who has been with the company twenty years. The pension in such cases would be $35 per month, plus $1 for each year of service over twenty years.

D.S.R. Parking Service Popular

AUTOMOBILE parking service was instituted some time ago by the Department of Street Railways, Detroit, Mich., in conjunction with its street car and bus terminal on Woodward Avenue, 5½ miles from the center of the city. The parking lot is situated about 150 ft. from Woodward Avenue, in the rear of the terminal arcade, which obscures it from the view of the



Banner across Woodward Avenue advertises automobile parking service of the Department of Street Railways, Detroit, Mich.

passing motorists. With the inauguration of this service, the department circulated handbills to persons driving in that vicinity, and the patronage gradually increased to a point where there were approximately 175 cars parked in the lot daily. Recently this patronage has been further stimulated by the erection of a streamer across Woodward Avenue, indicating the location of the lot, and featuring the exceptionally low rate of 10 cents for all-day parking. The first day that the banner was erected there was an increase of 75 cars in the lot, and there is every indication that the full parking capacity of approximately 300 cars will soon be reached.



A spacious and well-lighted shop encourages good workmanship

Surrounding Men With

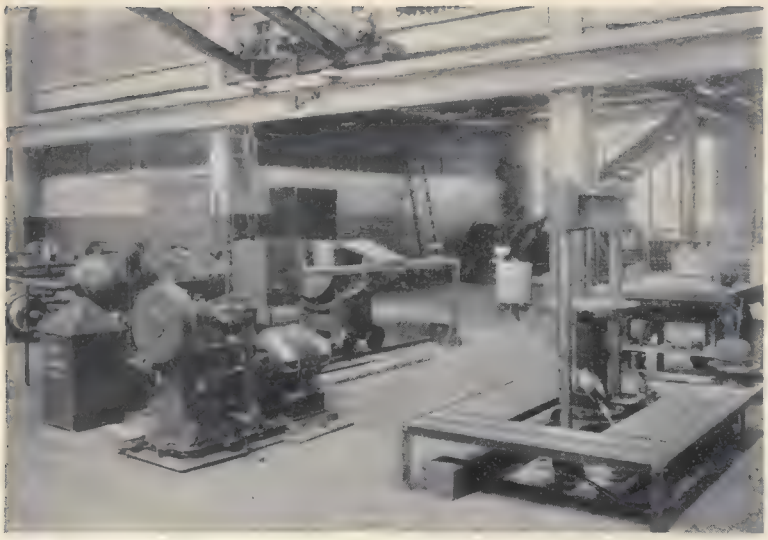
CONVENIENCES

By H. W. McCARTY
Master Mechanic Capital Traction Company
Washington, D. C.

Labor is today the most important element in maintenance work and it is vital that all possible steps be taken to promote its efficiency

OF ALL the items entering into the maintenance of electric railway equipment, no single item represents so large a part of the cost as labor. It is, therefore, highly important and necessary, in order to get the maximum efficiency out of labor, that men be surrounded with those conveniences and comforts that will in a large meausre cause a voluntary response to the demands of modern efficiencey. In some instances, the charge is made that modern day labor is not as efficient, is not as responsive to the ever-increasing demands for economy and high standards of maintenance as it was in the past. This may or may not be true, but the fact remains that the average production or maintenance plant has not kept pace in meeting the rapidly changing conditions, in so far as they apply to the needs of the human element, by surrounding men with those conveniences and comforts that will promote the greatest degree of satisfaction and contentment. An agreeable surrounding elevates the morale, creates an enthusiastic cooperation and has a most definite and direct bearing on the character of the work performed.

Equipment men are more alive than ever to the fact that higher standards of maintenance and inspection will improve performance, and this not only results in reducing ultimate maintenance, but has the far greater effect of improving public relations by the prevention of equip-



Individual motor drive eliminates unsightly belting and makes the shop a better place in which to work

ment failures in service. With this thought in mind, no effort should be spared in seeing that men who are engaged in the important work of maintenance are supplied with the proper tools to do that work, and that they are provided with those comforts and conveniences that will bring a real interest in their work.



Suction waste removal system promotes cleanliness and protects health of employees

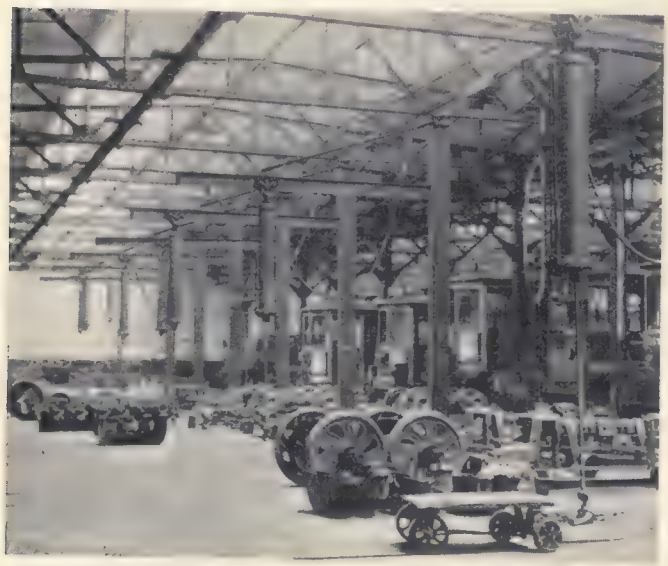
Shop methods, processes and tools used in the upkeep and maintenance of equipment become obsolete in time. There is a wide field for study in regard to the improvement of the machinery used in many of the shop plants. We cannot hope to modernize the human element without modernizing the mechanical element as well. Therefore, we should not expect the same high standard of workmanship from the man who is not given modern tools with which to do his work as we do from the man who is supplied with such tools and appliances. By the same token, we cannot expect to maintain the same high morale in an organization of men who are not surrounded with modern conveniences in the form of ideal shop layouts, as in those organizations which have provided for the welfare and comfort of the employee. Much is said and written about the modernization of equipment and operation, but too little stress seems to have been laid upon the need for the modernization of the conditions affecting the human element, which, after all, is largely responsible for the efficient manner in which equipment may be maintained and operated.

Owen D. Young has very truly said: "Time and brawn alone are not factors by which the barometer of productivity can be forecast: the problem today is to deal with the limits within which men can work with zest and spirit and pride of accomplishment. When zest departs, labor becomes drudgery; when exhaustion enters, labor becomes slavery."

Modern tools help a man to feel that the organization of which he is a part, is an up-to-date organization, and the fact that he is given modern appliances with which to work is an incentive for him to demonstrate his ability to turn out more and better work. Men will not reflect that contentment and satisfaction with their jobs if physical effort is largely depended upon to perform labors and duties that should be lightened by the use of modern appliances. Conferences for the training of foremen



Convenient storage of paints is an important factor in shop cleanliness



Numerous and convenient hoists save much time and labor

and workmen have come much to the fore in recent years, and they have accomplished much toward inspiring men with a higher conception of their jobs. How much more enthusiasm could be aroused in the individual, if, coupled with this training, he is supplied with the proper tools with which to carry out any ideas he may have acquired through these conferences in the matter of increased efficiency or improved methods of operation.

It is rather a sad reflection that, in the past development of the street railway industry, too little attention was given to the study of labor conditions, with the result that on many properties men are required to perform the work of maintenance in surroundings and with tools that thoroughly discourage the creation of a lively interest on the part of the men.

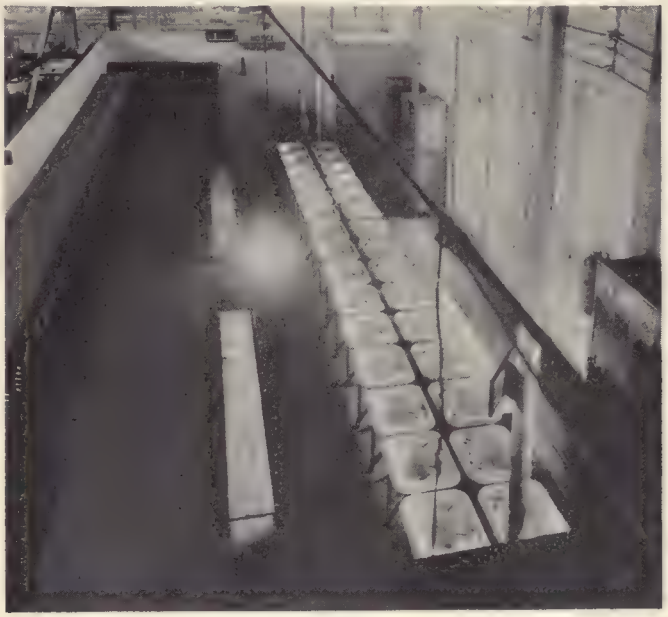
Shops should be laid out and arranged so as to provide proper light, ventilation, and sanitation. The cost of these and many other conveniences that can be supplied to the workman will be more than justified by the increased mental and physical effort exerted in his work, and the building-up of an invaluable morale in the organization. Work, under conditions and surroundings that are pleasant and comfortable, no matter how hard, does not produce that feeling of fatigue and restlessness that accompanies labor performed under conditions that are far from ideal. A contented employee is an asset, for contentment breeds good will. These attributes, in turn, are contagious, and are forerunners of a spirit of co-operation, that, if fostered, will go a long way in any organization toward solving the problem of successful and economical operation.



Adequate storeroom facilities contribute greatly to the efficiency of the shop



First-aid cabinet and bulletin board remind employees of the importance of safety



Lockers and washing facilities are an important part of the shop equipment

No company can render the best type of service unless it has a well-trained and enthusiastic group of employees. This condition is particularly true of the electric railways; everything possible might be done in the way of improving equipment and service, but maximum results can never be obtained without the wholehearted co-operation of the men, of whom some are in the somewhat peculiar position of having to sell the product which they manufacture.

More Route Changes in Brooklyn

NEW surface car routings of the Brooklyn & Queens Transit Corporation in the vicinity of the Manhattan Bridge and Brooklyn Bridge plazas were made effective on Aug. 25, contributing to traffic relief at the bridge approaches and allowing an improvement of street car service. These changes follow an extensive rerouting in the Borough Hall section, completed on April 6.



Demonstration school of Cleveland Railway where linemen familiarize themselves with details of overhead construction

Instruction School for Linemen

Since the establishment of training facilities the Cleveland Railway has decreased the number of trolley wire breaks and reduced expenditures for overhead materials and supplies

By Angus Scott
Assistant Superintendent of Overhead Lines, Cleveland, Ohio

REALIZING that the secret of efficient line construction and maintenance lies solely in the knowledge possessed by the workmen of their daily tasks, the line division of the Cleveland Railway has developed a method of training its employees which has proved effective. If workmen can be told how to do a certain job, and also see the act performed on a model at the same time, they are far better able to fully understand the problem than if they are merely told how to do the work. With this point in mind, a small scale model of actual overhead construction has been erected in the basement of line division headquarters for the instruction of the linemen. As may be seen in the accompanying illustration, the wire is erected at a height comparable to working conditions on the towers of the line trucks and involves all the elements of a line—poles, feeder cables, span wires, frogs and crossings.

With this construction before them, the foremen and linemen are made familiar with the standard construction as shown in their standard books, and anything not clear in the book is instantly made clear through the model. How to locate switch frogs accurately, the proper method of making various ties, the location of breaks or grounds in telephone circuits, and innumerable other items can be discussed and performed by the men under supervision. Any new device or method of doing a job more quickly or efficiently can be tried out and demonstrated to the men.

Construction which is not standard, and that which embodies the use of excessive fittings, is also erected. Foremen, or those in charge of line trucks, are examined as to the details of this construction. They are then shown how a saving in both labor and materials may be effected by eliminating excess parts which would have to be periodically renewed, and by properly installing fittings so as to secure the maximum life. Correct construction is thoroughly explained to the men, with the end in view of having them understand the actual savings in dollars and cents which is brought about by obtaining the maximum life of fittings with a minimum amount of wear on the contact wire.

The model overhead plant is especially valuable in the instruction of drivers and helpers in the proper methods of installing overhead fittings, how to use their tools and how to handle blocks and tackle on a tower truck. This may be accomplished by having the men work in a small area bounded by wooden horses fashioned into a square by means of short timbers, giving the effect of a tower

table. New men are allowed to practice on the model instead of attempting to practice while working on the line. This model line, especially, proved its worth when it was necessary to practically double our working force when engaged in a rapid transit construction program.

The system of line maintenance, which is based on car movements, is explained to the men, and the stages at which different fittings are to be regarded as worn out are shown by attaching to the model actual fittings which have been removed from the line. The necessity for accurate judgment can be stressed by showing the effect on the contact wire when fittings have been allowed to remain too long in the line at acceleration points or other bad spots.

Apparatus such as wire gages, dynamometers, micrometer gages, and the use of tension-temperature charts are explained and used on the model construction. The use of these instruments results in construction which can be economically gaged and controlled, but the men using them cannot merely follow the instructions concerning their use, but must also know the "why" and "how" concerning them or our plan of procedure will be defeated.

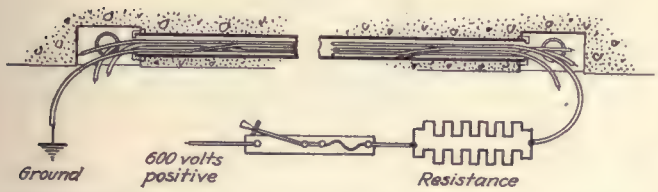
In the school, the physical characteristics of trolley wire are discussed with the men. Such facts as wire fatigue, breaking strength, expansion and contraction of wires with temperature variations are explained to them. Various samples of wire that have broken due to fatigue are shown, as are also samples of wire that should have been removed because of liability of breaking due to fatigue. In conjunction with the line school, a combined course in principles of foremanship and the elements of practical electricity is being conducted for the men.

That the school has fully justified the time and little investment put into it may be readily seen by the fact that all the major items of expense for line material such as ears, splicers, frogs and trolley wire, show considerable reductions from the previous year. A comparison of materials used during 1928 and 1929 shows a decrease of 3,020 ears during 1929. Inherent trolley breaks have also been decreased to a minimum.

Loosening Tight Wires in Conduit*

By R. S. McIntosh

Superintendent of Electrical Construction
Cleveland Railway



Heating tight wires in conduit, as done by the Cleveland Railway, softens insulation and makes removal easy

SOMETIMES wires laid in iron conduit, which after years of service have adhered tightly to the conduit walls, must be removed. The electrical maintenance division of the Cleveland Railway power department has devised a satisfactory method for loosening them when it is impossible to pull them out by ordinary means.

A bank of resistances with a capacity five to six times the current rating of the wire to be removed is placed in series with it through a fused switch, as shown in the diagram. The switch is then connected to the 600-volt line and the other end of the wire grounded. In a short time the heat developed in the wire so softens the insulation on it and on the other wires as well that they are pulled out easily. This method has been successful when wires were broken off so close to the pull boxes that no pulling was possible.

*Submitted in Electric Railway Journal *Prize Contest.*

Exhaust Gas Fumes Discharged From Roof of Bus



Detroit D. S. R. bus equipped for roof discharge of exhaust fumes



An inconspicuous insulated casing carries the exhaust pipe up through the left rear corner of the bus

BY DISCHARGING the exhaust gases from the engines through the roof of the bus, the Department of Street Railways, Detroit, has been able to secure better ventilation and keep obnoxious fumes out of the interior and away from pedestrians as well. The gases are carried above the suction zone behind the vehicle so that they do not follow along with it.

The exhaust pipes from the two engines are joined at the left side of the bus into a single discharge pipe of square cross-section, and are carried upward to a point approximately 3 in. above the roof. Surrounding the exhaust pipe is a casing of 12-gage sheet steel, covered

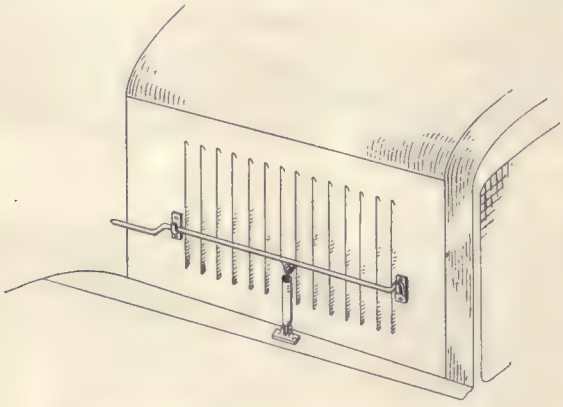
with a ¼-in. layer of molded fire-resisting material. This outer air space continues out to a point approximately 5 in. above the roof, ending in a flared cap. By this means a suction is created and cool air is drawn from within the bus into the air spaces around the exhaust pipe. This keeps the outer casing cool and eliminates any fire hazard or possibility of burning a passenger. Condensed vapors drain through a carbon-cleaning trap door with three ⅛-in. holes bored through it.

Road tests have shown that the exhaust gases are carried to a height sufficient to obviate inconvenience, and all objectionable noises have been eliminated. No added back pressure is evident.

Bus Hood Clamp Locks Easily*

By L. Rose
Cleveland Railway

IN ORDER to overcome the defects experienced with motor coach hood locks, a simple and inexpensive hood clamp has been developed by the Cleveland Railway. The hood locks were sometimes found difficult to latch, with the result that mechanics and operators developed a tendency to latch only those most conveniently located. It was also found that the hood locks were often unfastened by vibration. With either of these two conditions present, the hood would rattle or vibrate excessively.



Easily installed bar clamp reduces vibration and improves appearance

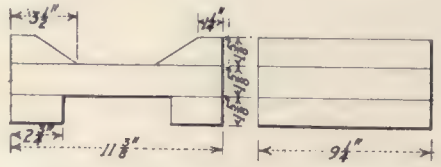
The hood clamp consists of a single bar which is pivoted at the center to a heavy-duty standard, sleeve-type hood-clamp body. This is fastened by means of a clevis bracket, which is bolted to the hood sill or the front fender in the regular manner. Two brackets are mounted on each side of the motor bonnet, one toward the front and one toward the rear which support the clamping bars and, in this way, securely lock the motor bonnet. By mounting the sleeve body on the hood sill close to the bottom of the hood, sufficient wedging action is obtained to prevent lateral vibration of the bonnet sides.

The bar clamp has been a satisfactory substitute for the hood locks by eliminating unnecessary noise due to loose hood sides and by reducing hood wear. The manipulation of the clamp is so simple and easy that it removes any temptation for the mechanics and operators to leave the hood unlocked.

**Submitted in* Electric Railway Journal *Prize Contest.*

Simple Cradle for Storing Armatures

TO KEEP armatures off the floor and prevent the windings becoming damaged by coming in contact with metallic chips or some other foreign substance the Richmond Railways, Staten Island, N. Y., has built a special cradle. It is made of oak and occupies a floor space of 11⅜x9¼ in. A 1⅝-in. plank 11⅜ in. wide by 9¼ in.



Since this armature cradle has been in service at the shop of the Richmond Railways failures have been reduced

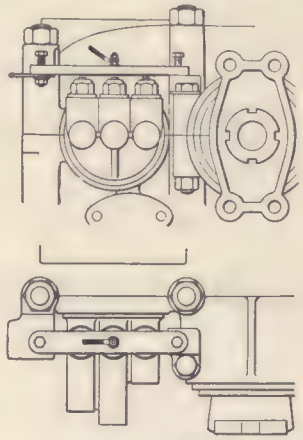
long is fastened to two rectangular blocks 2¾x9¼ in. Two tapered blocks bolted to the top of this plank directly over each foot provide a support for the armature and prevent rolling. These blocks are 1⅝ in. thick and 9¼ in. long. The bottom dimension is 3½ in. and the top 1¼ in., thereby providing a 2¼-in. taper.

Warning Signal Insures Proper Meshing of Gears*

By E. von Pirch

Hamburger Hochbahn Aktiengesellschaft
Hamburg, Germany

WEAR of transmission change gears on buses of the Hamburger Hochbahn Aktiengesellschaft was at times considerable. This was, to a great extent, due to the neglect of the operators to throw in the gear shift lever fully when changing speeds. As a result, the gear teeth did not mesh their full width, and were soon stripped by the excessive strain imposed upon them.



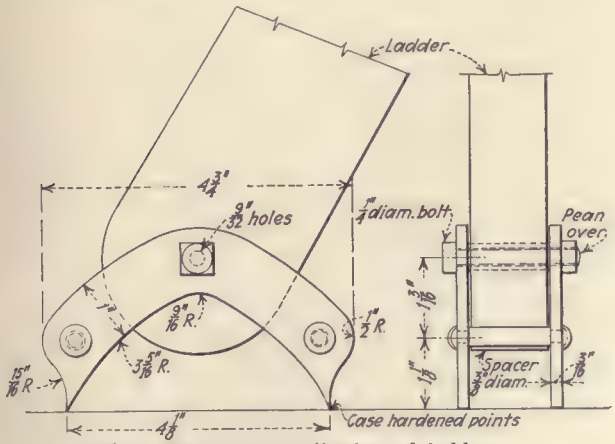
An electric circuit is completed through gear rods when gears are not fully meshed lighting a red lamp on the dash

To correct this fault, a red lamp is placed on the dashboard and made to light whenever the gears did not mesh fully. This is accomplished by placing the gear rods in the circuit with the lamp by a simple electrical contact at the arresting pin. With the gears fully in mesh, the lamp is shunted, but when the gears are not fully in mesh the circuit is completed through the lamp. The device has not only reduced failures, but has lessened the time for overhauling gears in the shop and the number of buses out of service.

Steel Plate Safety Shoes Fitted to Ladders*

By Terance Scullin
Superintendent of Equipment and Buildings (Retired)
Cleveland Railway

LADDERS are prevented from slipping by a device designed and put into effective use at the Harvard Shops of the Cleveland Railway. By means of sharply pointed safety shoes, the foot of the ladder obtains a firm bearing against both vertical and horizontal forces.



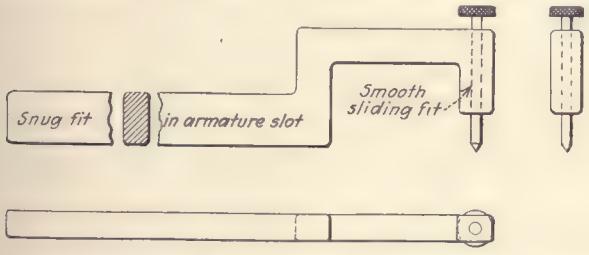
Safety shoes prevent slipping of ladders

The safety shoes consist of four U-shaped plates, two for each ladder leg, and are made of $\frac{3}{16}$-in. steel plate. The arms of the U's are brought to a point and hardened in order to increase their resistance to splitting or cracking. They are mounted at the end of the ladder leg on a toggle consisting of a $\frac{1}{2}$-in. bolt and a length of standard $\frac{1}{8}$-in. pipe. Two spacers made of $\frac{3}{8}$-in. steel rod keep the plates equidistant.

Gage to Check Alignment of Commutators

By J. S. Dean
Renewal Parts Engineering Department
Westinghouse Electric & Manufacturing Company

ONE of the essential factors for good commutation is the correct alignment of the commutator bar or mica with respect to the armature slot of the core. Depending upon the design of the armature windings of



Steel gage to check alignment of armature core slots with respect to commutator bar or mica

railway motors, the slots in the core should line up with either the commutator mica or the center line of the bar. For the various types of motors, this information should be obtained from the armature winding diagrams.

When refilling a worn-out commutator on a railway armature core with a new set of assembled segments, or replacing a new commutator, it is common practice to check its alignment by means of a piece of string held along the center line of the tooth or the slot of the core. This method of checking the assembly is more or less unreliable, as it depends entirely upon the accuracy of the workman's eye. A simple tool, designed as shown in an accompanying illustration, eliminates all doubt in connection with this work and provides a means to get the correct alignment of the commutator bar or mica with respect to the armature core slot. It is possible, for certain types of machines, to simplify this tool, by making the center point a part of the main body of the tool, which would eliminate the knurl headed sliding pin. Such a tool can readily be made at a very moderate cost and should prove to be a good investment for better maintenance.

Storage of Lamps During Car Overhaul*

By C. B. Hall
Chief Clerk Mechanical Department
Virginia Electric & Power Company, Norfolk, Va.

FOR the storage of electric bulbs during car overhauling periods, a convenient portable cabinet has been made in the shops of the Virginia Electric & Power Company at Norfolk, Va. The previous practice of allowing lamps to remain in their sockets while the car underwent an overhaul caused considerable breakage.



Handy cabinet used for the housing of lamps during the period of car overhaul

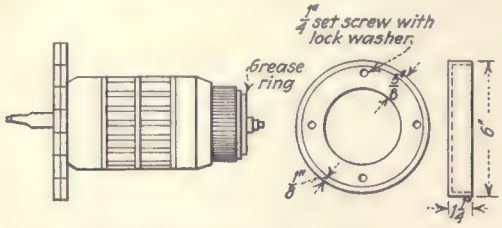
The plan of removing all lamp bulbs when cars are shopped has now been adopted, and the cabinet has been made for the special purpose of housing the lamps handily, pending their reinstallation in the cars on leaving the repair shops. The cabinet measures 16x19½x36 in., with five shelves having 1⅛-in. drilled holes to accommodate 150 lamps. A regular lamp socket with a non-threaded collar is placed on one side of the cabinet for a quick push-in test of each lamp prior to placing it on one of the shelves.

**Submitted in* Electric Railway Journal *Prize Contest.*

Grease Ring Protects Commutators on Ball-Bearing Motors*

By H. J. Beadle
Equipment Engineer
Dallas Railway & Terminal Company

GREASE and oil are very easily spattered upon the commutator and brush-holders of railway armatures of the ball-bearing type, especially during hot weather. To protect these parts, the Dallas Railway & Terminal Company has recently equipped the armatures of its traction motors with light-weight grease rings.



Brass cast ring fitted to ring nut keeps oil off commutator and brush-holders of ball-bearing armatures

These grease rings are cast from brass and are attached to the armature ring nut which holds the commutator in position. They are held securely to the ring nut by four set screws with lock washers, lightly soldered to the ring nut.

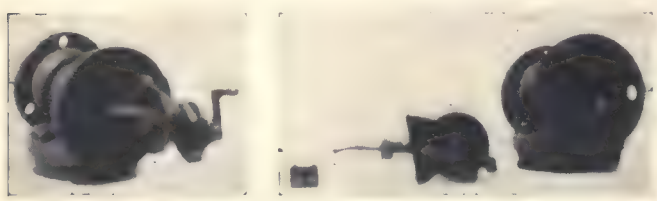
Since the installation of this device, the commutators and brush-holders have been free from grease and oil.

Slide Valve Grinder*

By C. W. Wood
Master Mechanic
Virginia Public Service Company
Hampton, Va.

GRINDING in of slide valves of type D relays is facilitated by a device developed in the shops of the Virginia Public Service Company, Hampton, Va. It replaces the tiresome method of hand grinding in which the mechanic used a rod 8 in. long with a ½-in. crossbar soldered across the rod about ½ in. from one end. The crossbar was placed in the air port of the slide valve, and moved back and forth by hand until the valve was seated.

The new device consists of a pair of automobile speedometer reduction gears, equipped with a handle and a flywheel to which a connecting rod and eccentric pin are attached. The eccentric pin is ⅜ in. off center, giving the connecting rod a stroke of ¾ in. A crossbar, ⅛×⅛×½ in. is fitted to the connecting rod in such a manner that it is held securely in the port of the valve by the weight of the connecting rod.



Valve grinding facilitated with a device equipped with speedometer reduction gears

The grinder is bolted to one of the bracket bolt holes at the face of the relay casting by means of an angle bracket fitted with a stud. Pressure is applied through the bronze spring of the slide valve. To remove the valve from the port, it is necessary only to lift the connecting rod and give the handle one turn.

By slowly turning the crank by hand, ample speed is obtained at the valve through a gear reduction of three to one.

Track Sand Stored by Compressed Air*

By W. S. Yeates
Georgia Power Company, Atlanta, Ga.

TRANSPORTATION of dried track sand from a central drying plant to elevated steel storage bins in various carhouses and storage yards has been accomplished on the Atlanta railway system of the Georgia Power Company by means of an old car equipped for the purpose with a 12-cu.yd. steel tank, a 160-cu.ft. air compressor, two 4-in. rubber discharge hose and the necessary pipe lines and valves.



Elevated storage tank filled from loading car

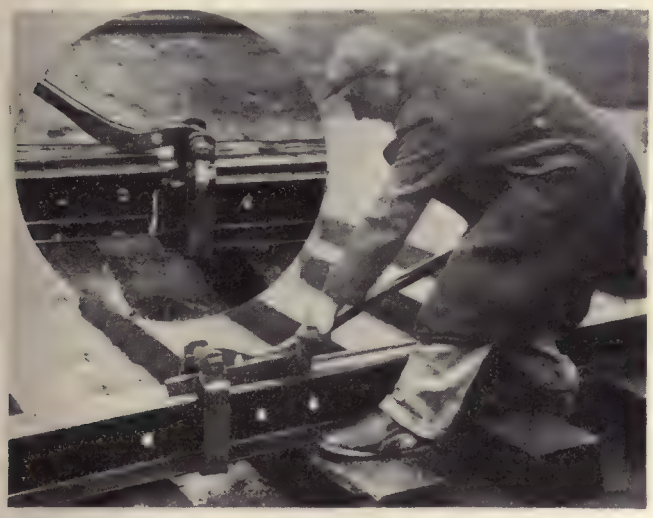
Sand is loaded into the car at the drying plant by inserting a hose into the tank through a cap which projects above the roof and forcing the sand through it by means of air pressure. In unloading the sand from the car to the elevated storage bins, air pressure is introduced above the sand in the tank by means of a pipe line from the compressor to the top of the tank. This pressure in the tank forces the sand through the discharge hose and up into the storage bin.

Each 4-in. discharge hose is provided with an auxiliary air line and a special butterfly valve which is located between the tank and the point at which the auxiliary pipe line is connected to the discharge hose. After the storage bin has been filled, the butterfly valve is closed, stopping further discharge from the tank. The auxiliary air line is then opened to clean the hose and loading pipe of the storage bin of any sand remaining in them. This prevents waste of sand and leaves the hose empty.

Leveling Bar Facilitates Joint Alignment*

By William Anthony
General Track Foreman Cleveland Railway

LEVELING and aligning of rails at the joints for the installation of splice bars is facilitated by a joint-leveling bar designed by the Cleveland Railway. Previously a track jack and a lining bar were used for



One man can do the entire job of splicing in a short time. The insert shows the leveling device that makes it easy to bring rails to proper alignment before attaching splice bars

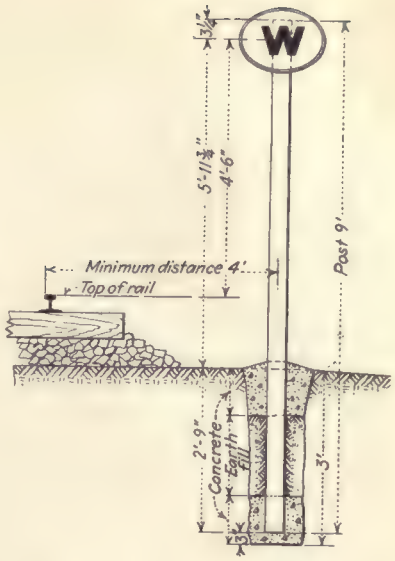
the purpose. This method required the services of two men, who often experienced difficulty in bringing the rails to the proper level and alignment. One man can use the new joint-leveling bar, which can readily be placed and fixed firmly in position. The entire work of splicing takes only 1½ minutes with the new device.

The bar, as shown in the illustration, consists of a lever that rests and pivots on the high rail. At the end of the lever is a pair of clamps that fit under the base of the low rail. The fulcrum is in such a position that very little force is necessary to bring the lower rail to the proper level. After the rails have been brought to the same height, a slight lateral motion of the lever is all that is necessary to bring them into alignment. A steel wedge is then placed between the cross member of the bar and the rails, holding them firmly in place and allowing the splicing to proceed without difficulty.

Old Rail Makes Satisfactory Whistle Post

By Joseph M. Hysan
Bridge Engineer United Railways & Electric Company Baltimore, Md.

ON THE Sparrows Point interurban line of the United Railways & Electric Company of Baltimore the conventional wood whistle posts which required frequent repainting and renewals have been replaced by metal posts utilizing pieces of old T-rail. The design consists of an oval-shaped casting of gray iron with the letter "W" and the outer rim raised ¼ in. above the surface. The letter and the outer rim are painted black and



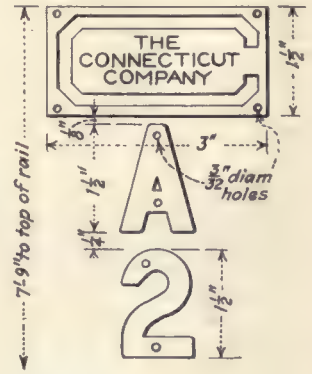
Whistle post made of old T-rail is used on Sparrows Point interurban line of United Railways & Electric Company of Baltimore

the background white. This disk is fastened to a piece of 60-lb. scrap T-rail cut to proper length and set in concrete. Some of these posts have been in service for about five years and are in perfect condition today.

*Submitted in Electric Railway Journal *Prize Contest.*

Marking Wood Poles for Identification

MARKING of wood poles to show ownership and identification numbers is done on the lines of the Connecticut Company by means of aluminum plates, letters and figures. A plate carrying the company's monogram is placed on the pole, in connection with an identification composed of letters and figures. All of these are made of No. 28 gage aluminum sheet. On the plate the letters are raised $\frac{1}{32}$ in. above the body. The single letters and numbers are raised $\frac{1}{16}$ in. and have all corners rounded. They are held to the pole by No. 12 gage oval-head diamond point aluminum nails, 1 in. long. These markers are placed on the street half of the pole, 45 deg.



Aluminum name plates and figures are used to identify wood poles of the Connecticut Company

from the perpendicular line facing the direction of traffic, for span construction. Where bracket construction is used, they alternate every other pole.

Where the Connecticut Company has rights on wood poles of another company, information is given by placing a nail with a raised letter "C" on top, on the pole. These nails are made of No. 3 gage steel wire 2½ in. long. In addition to the identification, a dating nail denoting the year in which the pole is set is driven in each wood pole not higher than 3 ft. above the ground line, on the street side. This practice has been found to be cheaper than painting the markings on the poles.



Spray painting destination signs at shops of Kansas City Public Service Company



Sign rolls are sprayed in a booth which can easily be closed off and ventilated by means of an exhaust fan

Spraying Destination Signs at Kansas City

PREPARATION and maintenance of signs rolls for 106 different destinations is carried on at the shops of the Kansas City Public Service Company by a reverse stencil arrangement designed by W. L. Briar, supervisor of the equipment department. Although the practice of spraying signs has been adopted on a number of properties, it is usually carried out by using individual letters. At Kansas city, however, the individual letters are permanently fastened together in groups for all the names frequently used.

Wooden patterns were first made of the complete alphabet, punctuation marks and the numerals 1 to 10. From these a sufficient number of lead letters were cast to assemble each individual destination title. This was accomplished by soldering the letters and figures to ¼x¼ in. steel bars, arranged on the back of the letters to hold them in perfect spacing and alignment. For future use, storage racks were provided so that the assembled names might easily be located. Each opening in the racks is numbered to correspond with the list of destinations.

The table used for the painting of the sign rolls is approximately 15 ft. long and 3 ft. wide. The top is covered with ¼-in. thick cushion felt, which in turn is covered with cloth. This gives a good cushion effect and prevents the signs from slipping. The edge of the table is equipped with a straight edge. This straight edge is notched at every 6-in. space in order that the lead destination names may be spaced accurately by means of a T-square.

In spraying a roll, the sign cloth is placed upon the cushioned-top table. The lead forms are set in place on the sign cloth and checked for perfect alignment. The operator then sprays the complete sign over the lead forms, the spray gun being filled with black sign lacquer. As soon as the spraying operation is completed, the sign is dried enough to enable the operator to remove the lead forms and to place the finished job on racks to dry completely. Approximately two hours are required for the sign to dry for service. All the destination sign painting work is done in a large booth. This booth is equipped with an exhaust fan to remove the lacquer fumes and assist in the drying of the sign.

The time required to paint one destination of the sign roll under this process averages one minute per name. With the old method of using paper stencils and cutting in the sign by hand, the time per name averaged five minutes. Not only is this new process much faster than the stencil but the company has found that it produces a clear cut and uniform sign of much better quality.

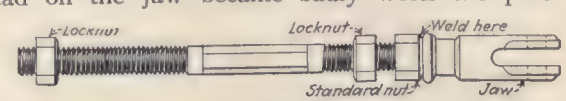


The use of lead letters produces a clear-cut destination sign

Increasing Truck-Jaw Life*

By J. Mondoux
Repair Department
Ottawa Electric Railway

LIFE of the jaws of bottom truck connections has been increased materially by a plan devised in the shops of the Ottawa Electric Railway. Previously, when the thread on the jaw became badly worn the part was discarded. Under the new plan, when the thread of the jaw wears so that the fit becomes loose, the jaw is repaired by the plan illustrated. One face of a thick



By welding a nut on to the bottom truck connection jaw a new fit is obtained and its life increased

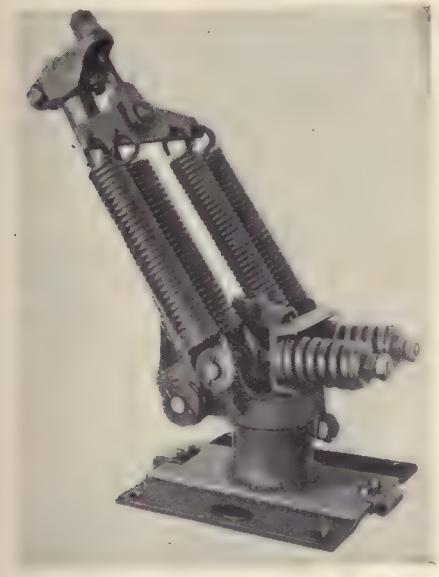
*Submitted in Electric Railway Journal Prize Contest.

standard-size nut, having the same thread as the jaw, is beveled off. The nut is then screwed on to the bottom truck connection and the jaw screwed on until it comes against the beveled face. The jaw and nut are then welded together. This procedure lengthens the threaded portion of the jaw about 2 in., making it better than new and bringing the bearing on new screw threads of the adjusting bar. If the thread of the nut that has been welded on begins to wear, all that is necessary is to cut off the nut and weld on a new one. This process can be continued as long as the truck connection and jaw remain serviceable.

NEW PRODUCTS for the Railways' Use

Light-Weight Trolley Base

REDUCTION in weight over the lightest of iron bases has been attained by the light-weight trolley base designed by the Westinghouse Electric & Manufacturing Company. It is designated as the Type US-24-A trolley base, and has been produced for use on city, suburban and interurban cars.



This trolley base weighs only 77 lb., complete with spring buffer

Weight reduction has been attained without sacrifice in strength by using rolled steel for the base, heat treated steel tubing for the pole socket, and cast steel for the turret. It is claimed that the reduction in weight of moving parts thus secured quickens the action of the pole and permits lower wheel pressures, while the inherent ability of the steel to absorb shock minimizes noise of operation.

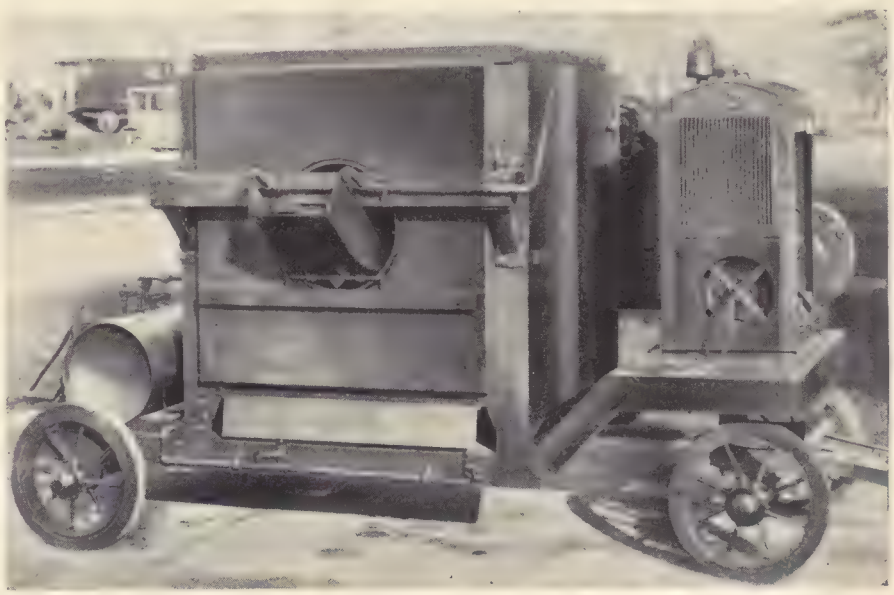
An important feature embodied in the construction is the use of Timken tapered roller bearings, there being two sets, one in the top and one in the bottom of the swivel. They are separated by a spacing bushing, and support the heavy cocking load due to the weight of the pole, harp and wheel and wheel pressure. This bearing pressure is distributed over the entire surface of the tapered rollers in a virtually perpendicular direction to the bearing surface. The tapered roller bearings also support the turret and thus prevent the bulk of the weight from being carried on the axle pin. By loosening one heavy locking screw in the flange of the turret the base can be lifted apart to expose the swivel bearing assembly. A nut on the end of the swivel permits adjustment of bearings.

The trolley base was designed to meet, with ample factor of safety, the maximum requirement of 1,000 amp. for momentary current carrying capacity, 750 amp. for continuous current carrying capacity, and operating wheel pressure on the contact wire up to 35 lb.

Portable Sand Drier and Mix Reheater

THE necessity for rapidly heating and drying sand or stone, or for reheating premixed and natural asphaltic paving materials, can be met with a new type portable heater which has been developed by the White Manufacturing Company, Elkhart, Ind. The heater consists of a rotating drum with internal cascading blades, mounted on self-aligning ball bearings and inclosed in a steel housing. A single-cylinder, 4 hp., radiator-cooled engine rotates the drum by means of a hardened roller chain.

An important feature of this machine is the indirect application of heat from two self-generating kerosene burners, located within the steel housing underneath the rotating drum. These burners apply the heat effectively on the outside of the drum so that no high temperature flame comes in contact with the drying or heating materials. This is said to be especially valuable in handling bituminous mixes, which can be very



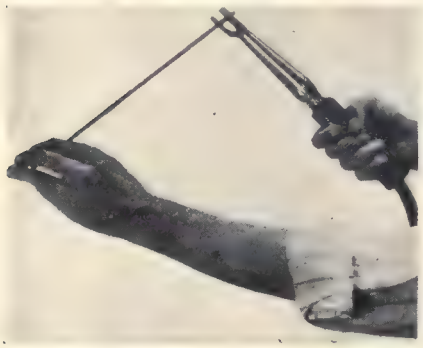
Inclosed drum prevents contact of material with flames from burners

easily damaged in open-flame type heating.

The heater is equipped with a steel towing tongue and is mounted on rubber-tired steel wheels with roller bearings. Kerosene is stored in a 30-gal. welded steel tank to which pressure is supplied by a 3-in. hand-operated air pump.

Light-weight Holder for Electric Welding

SEVERAL new features are incorporated in an electrode holder for arc welding brought out by the Stoody Company, Whittier, Cal. While the weight is only 17 oz., the holder is constructed of steel forgings with a turned composition fiber handle, and the conductor cable is attached to it without the usual process of sweating in or soldering.



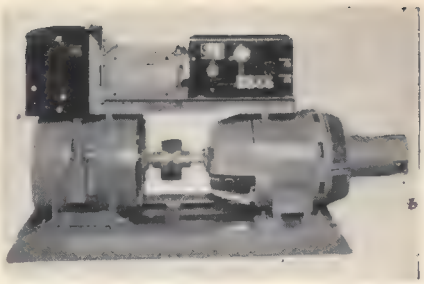
Electrode waste is small with this narrow-jaw holder for electric welding

The three jaws are corrugated, each at a different angle, so that the electrode may be held securely at any working angle. The holder arms are made of a special alloy steel, and are nickel plated and buffed. The spring tension is sufficient to hold electrodes from $\frac{1}{8}$ in. to $\frac{5}{16}$ in. or even greater diameter. The holding jaws remain parallel regardless of the size of the electrode, and the tension pressure extends through the entire length of the prongs.

The principal feature claimed for this holder is the narrow jaw which permits the use of the electrode with a waste of less than $1\frac{1}{2}$ in.

Large-Capacity Welder

DEMANDS for a high welding current to be used with large-size metallic and carbon electrodes have been met by a welder recently placed on the market by the Lincoln Electric Company, Cleveland, Ohio. This welder may be had in either the portable-truck type or stationary-truck type. It is a motor-driven, single-operator, variable-voltage machine, and has a current range of from 180 to 750 amps. The motor and generator are direct connected and the working mechanisms of all controls are contained in a ventilated, inclosed steel cabinet with hand regulators and switches mounted on a panel which forms a side of the cabinet. The control panel contains rheostats, diverter switch, safety starter switch, volt-ammeter and wing nut terminals for cables. The control cabinet is mounted directly over the motor-generator for easy access by the welding operator. This arrangement permits the removal of the motor-generator armature without disturbing any other parts.



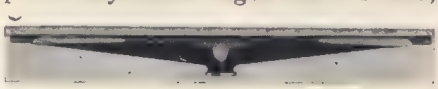
Control mechanisms conveniently arranged above motor-generator set for welding

The facility with which the lead cables may be connected to the wing nut terminals lessens necessity for a polarity reversing switch.

Improved Marathon Ear Reduces Wheel and Wire Wear

WITH the purpose of still further reducing the wear on trolley wire, ears and wheels, the Ohio Brass Company, Mansfield, Ohio, has just put on the market a new ear having tapered sides and known as the improved Marathon. In place of the shorter and more abrupt approach-and-leave of the old type ear the improved Marathon has a long, gradual, tapered approach-and-leave. The tapered approach permits the trolley wheel to pass on to the ear without bounding from the wire, to ride easily over the ear and to pass from the ear to the wire without any abrupt pounding action. The whole wheel passage is said to be smooth and continuous.

Tapering begins at the end with practically knife-edge thinness and, in the 15-in. ear, extends almost 4 in. toward the center section. Because of the long, tapered approach, it has been possible to increase slightly the section at the center, the point of greatest wear. This makes no appreciable difference in the peening qualities but adds materially to the service life of the ear. The tapering has been effected by means of special milling equipment which cleanly cuts the metal and insures uniform smoothness and precision.

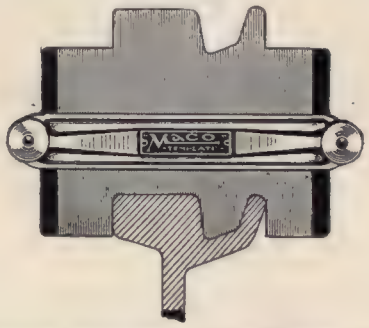


Improved Marathon ear affords easy approach to trolley wheel

Service tests have indicated that because of the smooth wheel passage, arcing and pitting of the wheel, ear and wire have been eliminated with the result that better and longer service is obtained from each.

Maco Template for Registering Rail Contours

DETERMINATION of rail contours is accomplished accurately and easily by means of a registering template made by the American Maco Template Company, Inc., New York City. This is composed of a number of fine strips of hard-drawn brass held in an aluminum frame. The thickness of each strip is 0.007 in. The laminations are held in position by two special clamps which are fitted with sections of corrugated rubber. When a profile is required, all that is necessary is to loosen the screws and gently press the adjustable template against the contour. The result of such pressure is that the laminæ take a perfect outline of the surface against which they are pressed, their extreme thinness materially assisting in the facility and precision of the process. When the impression is complete, the laminæ are held in position by merely locking the screws. From the template thus produced other permanent templates may be made or a record of the section of the profile may be kept and filed for future reference.



Template composed of hard-drawn brass strips facilitates the registering of rail contours

Monthly and Annual Financial Reports

	Key System Traction Co., Oakland, Cal.		Fort Wayne & Lima R.R., Fort Wayne, Ind.		Holyoke Street Railway, Holyoke, Mass.		Saginaw Transit Company, Saginaw, Mich.		United Traction Co., Albany, N. Y.	
	1929	1928	1929	1928	1929	1928	1929	1928	1929	1928
Railway operating revenues	$7,106,920	$7,239,063	$456,265	$445,822	$703,745	$759,104	$656,860	$639,692	$2,564,700	$2,655,840
Railway operating expenses	6,565,270	6,403,389	425,500	398,912	605,026	652,234	486,064	486,634	2,312,818[1]	2,531,813[1]
Net revenue, railway oper.	$541,650	$835,674	$30,765	$46,910	$98,719	$106,870	$170,796	$153,058	.....	.....
Taxes	438,655	464,684	7,585	7,390	13,683	14,134	30,442	27,624	.....	.....
Operating income	$102,994	$370,990	$23,180	$39,520	$85,036	$92,736	$140,353	$125,433	$251,882	$124,027
Non-operating income	125,914	146,050	33	126	24,429	24,120	.....	.....	18,650	15,697
Gross income	$228,908	$517,041	$23,213	$39,646	$109,465	$116,856	$140,353	$125,433	$270,532	$139,724
Deductions from gross income	1,191,030	1,170,994	736	2,108	82,605	83,313	115,867	116,436	.....	.....
Net income	*$962,122*	*$653,953*	$22,477	$37,538	$26,860	$33,543	$24,486	$8,997	*$339,040*	*$634,879*
Operating ratio	0.924	0.885	0.923	0.895	0.860	0.859	0.740	0.761	.....	.....

	Brooklyn-Manhattan Transit Co., New York, N. Y.[8]		New York & Queens Co. Ry., New York, N. Y.		Third Avenue Railway, New York, N. Y.		Schenectady Railway, Schenectady, N. Y.		City Railway, Dayton, Ohio	
	1930[7]	1929[7]	1930[7]	1929[7]	1930[7]	1929[7]	1929	1928	1929	1928
Railway operating revenues	$60,700,981	$48,586,548	$921,950	$897,248	$15,090,262	$15,611,026	$1,709,588	$1,623,315	$950,997	$962,171
Railway operating expenses	39,786,537	31,256,534	870,072[1]	761,483[1]	12,627,317[1]	13,060,525[1]	1,410,344	1,437,895	787,862[1]	741,447[1]
Net revenue, railway oper.	$20,914,444	$17,330,014	.....	.....	.....	.....	$299,244	$185,420	.....	.....
Taxes	4,001,506	3,304,037	.....	.....	.....	.....	92,639	96,808	.....	.....
Operating income	$16,912,938	$14,025,977	$51,878	$135,765	$2,462,945	$2,550,501	$206,605	$88,612	$193,612	$220,724
Non-operating income	861,347	1,047,645	16,505	12,063	228,077	231,238	4,112	2,979	32,236	22,531
Gross income	$17,774,285	$15,073,622	$68,383	$147,828	$2,691,022	$2,781,779	$210,717	$91,591	$225,371	$224,225
Deductions from gross income	9,280,067	8,555,249	13,755	13,360	.....	.....	257,015	257,458	12,258	8,767
Net income	$8,494,218	$6,518,373	$54,628	$134,468	*$199,460*	*$286,333*	*$46,298*	*$165,867*	$213,113	$234,488
Operating ratio	0.656	0.643	.....	.....	.....	.....	0.825	0.886	.....	.....

	Lake Shore Electric Ry., Sandusky, Ohio		Erie Railways, Erie, Pa.		West Penn Railways, Pittsburgh, Pa.		Memphis Railway, Memphis, Tenn.		Northern Texas Traction Co., Fort Worth, Tex.	
	1929	1928	1929	1928	1929	1928	1929	1928	1929	1928
Railway operating revenues	$1,871,693	$1,899,166	$1,214,362	$1,167,146	$7,127,960	$6,863,033	$2,915,090	$2,922,428	$2,514,379	$2,623,044
Railway operating expenses	1,704,566[1]	1,644,867[1]	791,496[1]	772,082[1]	3,508,720[1]	3,635,580[1]	1,997,052[1]	1,943,020[1]	1,676,132	1,675,502
Net revenue, railway oper.	.....	.....	.....	.....	.....	.....	.....	.....	838,247	947,542
Taxes	.....	.....	.....	.....	.....	.....	.....	.....	165,696	190,497
Operating income	$167,127	$254,299	$422,866	$395,064	$3,619,240	$3,227,543	$673,470[2]	$738,967[2]	$672,551	$757,045
Non-operating income	.....	.....	.....	.....	.....	.....	792	3,331	156,700	164,480
Gross income	$167,126	$254,299	$422,866	$395,064	$3,619,240	$3,227,543	$674,262	$742,298	$829,251	$921,525
Deductions from gross income	622,651	604,639	288,961	289,216	1,324,411	1,296,116	528,343	517,551	.....	.....
Net income	*$455,524*	*$350,340*	$133,905	$105,848	$2,294,829	$1,931,337	$145,919	$224,747	$293,170	$358,860
Operating ratio	.....	.....	.....	.....	.....	.....	.....	.....	0.666	0.649

	Havana Electric Railway, Havana, Cuba		Liverpool Corp. Tramways, Liverpool, England		Oslo Tramways,[4] Oslo, Norway		Mexico Tramways,[3] Mexico City, Mex.		La Plata Electric Tramways, La Plata, Argentina	
	1929	1928	1930[6]	1929[6]	1929	1928	1929	1928	1929	1928
Railway operating revenues	$5,694,051	$5,415,175	£1,602,228	£1,567,180	11,560,831	$11,320,800	10,724,937	$11,684,875	£117,798	£114,696
Railway operating expenses	4,608,568[1]	4,494,472[1]	1,392,526	1,292,419	8,404,594[1]	8,430,367[1]	10,176,013	10,393,765	91,109	85,208
Net revenue, railway oper.	.....	.....	.....	.....	.....	.....	548,924	1,291,110	.....	.....
Taxes	.....	.....	.....	.....	.....	.....	323,832	360,113	.....	.....
Operating income	$1,085,483	$920,703	£209,702	£274,761	3,156,237	2,890,433	225,092	930,997	£26,689	£29,478
Non-operating income	31,457	39,171	.....	.....	256,404	259,616	.....	.....	.....	.....
Gross income	$1,116,940	$959,874	£209,702	£274,761	3,412,641	3,150,049	.....	.....	£26,689	£29,478
Deductions from gross income	739,360	742,926	137,687	120,322	1,853,982	1,823,160	.....	.....	5,949	5,9292
Net income	$377,580	$216,948	£72,015	£154,438	1,558,659[5]	1,326,889[5]	.....	.....	£20,740	£23,549
Operating ratio	.....	.....	86.9	92.4	.....	.....	0.951	0.889	.....	.....

[1] Including taxes. [2] After depreciation of $244,568 in 1929 and $239,941 in 1928. [3] Figures in Mexican currency. [4] Figures in kroner. [5] Before depreciation. [6] Year ended March 31. [7] Year ended June 30. [8] Preliminary figures, including Brooklyn & Queens Transit System.

	Operating Revenue $	Operating Expenses $	Taxes $	Gross Income $	Net Income $
Key System Transit Co., Oakland, Cal.					
May, 1930	572,548	530,588*a*	.....	50,596	.....
May, 1929	596,646	550,215*a*	.....	56,638	.....
5 mo. end. May, 1930	2,813,197	2,647,717*a*	.....	207,776	.....
5 mo. end. May, 1929	2,897,664	2,735,811*a*	.....	210,240	.....
Market Street Railway, San Francisco, Cal.					
July, 1930	735,453	649,901*a*	.....	85,552	32,534*b*
July, 1929	781,241	660,985*a*	.....	120,256	60,687*b*
12 mo. end. July, 1930	9,462,944	7,965,902*a*	.....	1,497,042	820,421*b*
12 mo. end. July, 1929	9,582,725	8,178,553*a*	.....	1,404,172	676,980*b*
Denver Tramway Corp., Denver, Colo.					
6 mo. end. June, 1930	2,038,224	1,402,195	245,166	413,917	163,206
6 mo. end. June, 1929	2,119,250	1,441,482	247,441	455,102	196,578
6 mo. end. June, 1928	2,142,946	1,417,089	258,480	491,316	242,210
6 mo. end. June, 1927	2,189,368	1,217,759	255,730	740,734	494,756

	Operating Revenue $	Operating Expenses $	Taxes $	Gross Income $	Net Income $
Jacksonville Traction Co., Jacksonville, Fla.					
June, 1930	79,087	69,132	8,716	881	.....
June, 1929	90,651	74,708	8,969	6,392	.....
12 mo. end. June, 1930	1,095,016	898,172	106,665	83,921	*71,399*
12 mo. end. June, 1929	1,170,896	948,063	106,554	110,024	*50,450*
Honolulu Rapid Transit Co., Honolulu, Hawaii					
June, 1930	83,919	49,362	9,149	26,429	15,104
June, 1929	84,625	47,694	7,932	29,999	18,776
6 mo. end. June, 1930	516,747	306,524	53,246	164,523	93,497
6 mo. end. June, 1929	527,607	303,303	58,328	172,534	105,238
Chicago Surface Lines, Chicago, Ill.					
July, 1930	4,535,460	3,897,075	.....	638,384	*50,242g*
July, 1929	5,077,970	4,097,625	.....	980,345	103,191*g*
Des Moines Railway, Des Moines, Iowa					
June, 1930	156,290	123,742	.....	32,547	*22,619*

	Operating Revenue $	Operating Expenses $	Taxes $	Gross Income $	Net Income $
Boston Elevated Railway, Boston, Mass.					
June, 1930	2,550,775	1,820,728	116,406	622,254	*113,749*
June, 1929	2,654,942	1,867,539	130,009	662,217	*32,187*
3 mo. end. June, 1930	8,188,784	5,704,615	390,818	2,127,490	*13,643*
3 mo. end. June, 1929	8,549,863	5,804,333	424,992	2,344,012	257,192
6 mo. end. June, 1930	17,042,375	11,704,519	794,832	4,601,403	378,560
6 mo. end. June, 1929	17,557,690	12,021,888	862,952	4,715,381	523,611
Boston, Revere Beach & Lynn R.R., Boston, Mass.					
3 mo. end. June, 1930	320,409	249,935	9,000	62,041	23,676
3 mo. end. June, 1929	321,118	247,981	9,950	63,694	26,452
6 mo. end. June, 1930	600,960	497,989	18,000	86,091	14,449
6 mo. end. June, 1929	600,456	483,925	20,000	99,573	25,795
Eastern Massachusetts Street Railway, Boston, Mass.					
July, 1930	617,220	435,884	25,164	166,518	3,926
July, 1929	686,923	467,879	29,281	207,566	44,884
7 mo. end. July, 1930	4,707,144	3,001,233	206,606	1,569,479	349,842
7 mo. end. July, 1929	5,124,412	3,168,119	228,862	1,856,294	582,573
Union Street Railway, New Bedford, Mass.					
3 mo. end. June, 1930	283,535	258,313	15,000	10,416	4,872
3 mo. end. June, 1929	319,374	273,272	15,000	31,556	27,800
6 mo. end. June, 1930	578,536	536,442	30,000	12,461	974
6 mo. end. June, 1929	633,532	556,826	30,000	47,665	40,792
Berkshire Street Railway, Pittsfield, Mass.					
3 mo. end. June, 1930	160,254	140,093*a*		20,161	*51,756*
3 mo. end. June, 1929	171,135	151,478*a*		19,657	*53,912*
6 mo. end. June, 1930	357,594	290,361*a*		67,233	*76,618*
6 mo. end. June, 1929	373,816	309,687*a*		64,129	*83,077*
Springfield Street Railway, Springfield, Mass.					
3 mo. end. June, 1930	618,438	483,448		127,137	57,249
3 mo. end. June, 1929	683,042	561,942		113,650	40,941
6 mo. end. June, 1930	1,294,357	998,890		280,114	138,976
6 mo. end. June, 1929	141,256	111,279		274,915	129,132
Worcester Consolidated Street Railway, Worcester, Mass.					
3 mo. end. June, 1930	711,795	532,442		163,312	60,712
3 mo. end. June, 1929	765,696	577,411		172,128	55,764
6 mo. end. June, 1930	1,501,506	1,087,701		381,721	172,287
6 mo. end. June, 1929	1,581,376	1,169,160		379,628	147,924
Kansas City Public Service Co., Kansas City, Mo.					
July, 1930	633,205	573,990*a*		61,215	*21,365b*
July, 1929	714,415	591,213*a*		123,202	48,094*b*
7 mo. end. July, 1930	4,914,435	4,151,367*a*		763,067	550,144*b*
7 mo. end. July, 1929	5,232,681	4,229,055*a*		1,003,625	550,269*b*
Illinois Terminal Co., St. Louis, Mo.					
June, 1930	566,548	411,954	32,684	121,910	86,421*d*
June, 1929	622,436	422,904	21,762	177,770	134,940*d*
6 mo. end. June, 1930	3,628,998	2,516,706	155,527	956,688	698,042*d*
6 mo. end. June, 1929	3,913,248	2,687,400	130,608	1,095,113	826,416*d*
Omaha & Council Bluffs Street Railway, Omaha, Neb.					
June, 1930	227,092	168,477		28,393	*16,838*
June, 1929	219,075	162,778		32,188	3,920
International Railway, Buffalo, N. Y.					
6 mo. end. June, 1930	5,078,809	4,370,742*a*		756,007	122,765
6 mo. end. June, 1929	5,451,496	4,590,513*a*		899,807	249,870
6 mo. end. June, 1928	5,538,871	4,622,947*a*		934,599	240,032
6 mo. end. June, 1927	5,423,725	4,901,175*a*		548,965	*176,272*
Cortland County Traction Co., Cortland, N. Y.					
3 mo. end. June, 1930	12,385	14,317	2,100	33,925	29,838
3 mo. end. June, 1929	11,050	10,991	2,100	36,795	32,904
Fonda, Johnstown & Gloversville R. R., Gloversville, N. Y.					
June, 1930	72,865	60,524	4,800	20,390	*12,940*
June, 1929	85,895	80,169	7,840	52,807	17,774
6 mo. end. June, 1930	484,717	377,702	28,800	116,547	*72,383*
6 mo. end. June, 1929	516,531	388,780	47,040	148,338	*46,488*
Brooklyn-Manhattan Transit System, New York, N. Y.*f*					
July, 1930	5,003,577	3,271,059	337,682	1,490,206	720,302
July, 1929	5,150,887	3,507,239	333,762	1,373,745	607,513
Brooklyn & Queens Transit Corporation, New York, N. Y.					
July, 1930	1,917,118	1,495,714	108,179	327,524	203,433
July, 1929	2,042,815	1,609,538	116,849	337,189	212,937
Hudson & Manhattan Railroad, New York, N. Y.					
July, 1930	954,538	202,515*a*		452,023	116,747
July, 1929	985,313	510,735*a*		474,578	138,602
7 mo. end. July, 1930	7,206,792	3,608,051*a*		3,598,741	1,254,583
7 mo. end. July, 1929	7,271,946	3,672,638*a*		3,599,308	1,247,032
Interborough Rapid Transit Co., New York, N. Y.					
July, 1930	5,382,547	3,880,434	198,549	1,303,563	*289,711e*
July, 1929	5,466,406	3,775,811	202,308	1,488,286	68,586
Long Island Railroad, New York, N. Y.					
June, 1930	3,662,765	2,167,013	345,934	1,148,961	994,968*d*
June, 1929	3,824,992	2,273,087	319,399	1,231,322	1,042,967*d*
6 mo. end. June, 1930	18,787,458	13,528,768	1,160,922	4,093,345	3,197,699*d*
6 mo. end. June, 1929	19,331,691	13,573,277	1,071,872	4,674,720	3,744,891*d*
New York Railways, New York, N. Y.					
June, 1930	478,122	412,151*a*		64,971	25,810*c*
June, 1929	541,944	456,275*a*		85,669	23,970*c*
6 mo. end. June, 1930	2,747,985	2,505,364*a*		242,621	*1,085c*
6 mo. end. June, 1929	3,076,297	2,725,422*a*		350,875	*10,606c*

	Operating Revenue $	Operating Expenses $	Taxes $	Gross Income	Net Income
New York, Westchester & Boston Ry., New York, N. Y.					
3 mo. end. June, 1930	672,478	361,081	77,905	236,335	*454,950*
3 mo. end. June, 1929	649,655	378,887	71,360	201,698	*441,754*
Staten Island Rapid Transit Co., New York, N. Y.					
June, 1930	224,989	161,999	17,000	45,990	39,052*d*
June, 1929	277,571	182,262	17,000	78,303	43,821*d*
6 mo. end. June, 1930	1,201,932	920,985	103,500	175,875	134,990*d*
6 mo. end. June, 1929	1,455,686	1,046,518	106,000	303,150	83,583*d*
Third Avenue Railway, New York, N. Y.					
July, 1930	1,429,731	1,116,731	95,581	241,457	2,067
July, 1929	1,507,861	1,228,496	97,511	206,065	32,467
Philadelphia & Western Ry., Norristown, Pa.					
May, 1930	61,065				8,504
May, 1929	69,139				14,047
5 mo. end. May, 1930	294,713				32,033
5 mo. end. May, 1929	328,933				58,226
Philadelphia & Western Railway, Norristown, Pa.					
July, 1930	50,893				*470*
July, 1929	63,210				9,906
7 mo. end. July, 1930	402,898				39,560
7 mo. end. July, 1929	460,239				81,154
York Railway, York, Pa.					
3 mo. end. June, 1930	725,297	446,319*a*		278,978	201,242
3 mo. end. June, 1929	677,605	394,010*a*		283,595	211,669
12 mo. end. June, 1930	2,930,732	1,673,772*a*		1,256,960	939,675
12 mo. end. June, 1929	2,747,333	1,519,252*a*		1,228,081	947,523
United Electric Railways, Providence, R. I.					
July, 1930	515,367	430,138	28,679	56,549	5,480
July, 1929	579,352	474,831	28,684	76,136	24,877
7 mo. end. July, 1930	3,957,999	3,335,151	224,874	397,973	39,756
7 mo. end. July, 1929	4,284,813	3,440,329	238,105	405,557	248,639
Memphis Street Ry., Memphis, Tenn.					
May, 1930	241,687	167,154*a*		74,630	29,535*b*
May, 1929	251,459	179,855*a*		71,609	28,065*b*
12 mo. end. May, 1930	2,875,851	1,994,446*a*		932,366	396,428*b*
12 mo. end. May, 1929	2,919,018	1,967,640*a*		954,509	433,200*b*
Galveston-Houston Electric Ry., Houston, Tex.					
June, 1930	45,659	25,708	2,565	17,383	
June, 1929	57,316	29,176	2,565	25,573	
12 mo. end. June, 1930	540,652	312,436	32,595	195,813	*74,054*
12 mo. end. June, 1929	609,311	321,302	31,717	236,291	*84,556*
Houston Electric Company, Houston, Tex.					
June, 1930	247,461	157,592	21,492	68,376	
June, 1929	280,162	174,322	25,121	80,617	
12 mo. end. June, 1930	3,259,700	2,056,556	258,932	973,587	589,240
12 mo. end. June, 1929	3,373,511	2,087,177	286,417	999,915	593,022
Edmonton Radial Railway, Edmonton, Alta.					
May, 1930	63,775	46,729		17,046	*2,681*
May, 1929	65,923	44,079		21,844	996
5 mo. end. May, 1930	368,550	238,439		130,111	3,315
5 mo. end. May, 1929	372,146	224,449		147,697	15,956
Havana Electric Railway, Havana, Cuba					
3 mo. end. June, 1930	1,331,067	1,095,636*a*		240,566	82,264*b*
3 mo. end. June, 1929	1,486,833	1,161,977*a*		332,718	171,754*b*
6 mo. end. June, 1930	2,687,130	2,244,476*a*		453,794	135,907*b*
6 mo. end. June, 1929	2,864,581	2,285,997*a*		593,610	271,673*b*

a Includes taxes. *b* Before depreciation. *c* Before income bond interest. *d* Net after rents. *e* Before dividends on Manhattan Railway guaranteed stock. *f* Including Brooklyn & Queens Transit Corporation. *g* Companies' share of divisible receipts.

New

Maintenance Contest

to Start Nov. 1

THE fifth annual Maintenance Contest conducted by ELECTRIC RAILWAY JOURNAL in conjunction with the American Electric Railway Engineering Association, will begin Nov. 1, 1930. More interest than ever before was shown in the contest which has just ended, and prospects are bright for keen competition next year. Full details concerning rules, etc., will be given in the October issue.

NEWS *of the Industry*

LATE NEWS

Baltimore, Md.—The Sun Cab Company, which operates a large fleet of taxicabs here, has been ordered by the Maryland Public Service Commission to take out public liability insurance for the protection of its passengers on or before Sept. 8. The order fixes a minimum sum of $10,000 for a single passenger and $20,000 for more than one passenger. The company may, however, as an alternative provide and maintain a bond or cash indemnity reserve fund of not less than $100,000, based on the number of cabs in operation.

✦

San Francisco, Cal.—Seizing the opportunity to secure life insurance at exceptionally low rates by adding to the company free policy a small amount paid voluntarily by themselves, 2,304 out of 2,667 employees of Market Street Railway have taken out additional insurance amounting to about $3,350,500 in protection.

✦

Camden, N. J.—Public Service Coordinated Transport carries passengers from its Jersey Bus Terminal in Philadelphia to Central Airport, Camden, where passengers board the planes and are taken to Atlantic City. Buses are operated from Bader Field in Atlantic City directly to the Public Service Union Bus Terminal in that city. The service was started on Saturday, July 2, and 300 passengers sought to be accommodated. Two trips were scheduled between Philadelphia and Atlantic City. Ten trips were operated. When the service was started it was planned to operate only on Saturdays and Sundays. However, the demand for service has necessitated a daily schedule.

✦

Hartford, Conn.—The Connecticut Company has adopted the one-man system on its Rockville line preparatory to the substitution of buses under permission from the Public Utilities Commission when convenient to the company. The Rockville-Hartford line is divided into three zones.

✦

Chicago, Ill.—Special service direct to the National Air Races at Curtiss-Reynolds Airport was operated by the North Shore Line from Aug. 23 to Sept. 1, inclusive, with reduced round-trip rates. Service by train was to Northfield station on the Skokie Valley route and thence by motor coach to the grandstand.

✦

Haverhill, Mass.—The Massachusetts Northeastern Railway installed bus service on three lines on Aug. 20 under a 5-cent zone fare. It is expected that the lines in the vicinity of Haverhill will be entirely motorized by Sept. 7. Service by bus between Haverhill, Mass., and Plaistow, N. H., will be started on Sept. 3.

(*Late News Continued on Page* 598)

Seattle Municipal Having Its Own Troubles

Many Problems Plague City Officials. Employees Again Paid With Warrants Redeemable in Future. Attempt at Refinancing Unsuccessful

SEATTLE'S chances for refinancing its Municipal Railway debt through a new issue of long-time utility bonds are decidedly slender. So Mayor Frank Edwards, prime mover in the refinancing efforts, has admitted after conferences with investment bankers and advisors closely in touch with the bond market.

With the problem again acute because of the railway's inability to cover its current payroll with cash from revenues, and, at the same time, meet minor bond and interest payments, an entirely new program of relief probably will have to be devised.

Efforts have been under way for more than a year to assure a satisfactory market for about $10,000,000 in new street railway bonds, payable in about twenty years. This, it is figured, would wholly retire the balance of nearly $9,000,000 still owing to the Pudget Sound Power & Light Company on the purchase price of the railway system, under a short-term contract which has been temporarily relieved by the moratorium. It was counted upon, also, to provide means of extending street car lines, buy new equipment and rehabilitate the entire system. Mayor Edwards says he has been advised that "a straight out-and-out street railway bond issue would not be attractive to investors under present conditions in Seattle."

Meantime, members of the City Council are considering two plans for relief, one to include an item of about $200,000 in the 1931 city budget to assist the street railway department out of tax funds with the cost of maintaining paving and planking between street car tracks. Councilman Case declares the railway is burdened with the entire cost of maintaining the paving between tracks, whereas it should be required to maintain only about 18 in. along its rails where special paving is laid to permit of easy access to the rails when repairs are needed. He would relieve the railway of the burden of maintenance costs of $403,000 a year on paving between car

(*Continued on Page* 602)

The Business Outlook

AFTER about two weeks delay due to drought scare, the signals of the beginning of definite business recovery now flicker faintly amid the encircling gloom. This week nearly every important weekly indicator has turned upward. Steel activity, coal production and carloadings are up more than seasonally; electric power output is increasing slowly; building is resisting seasonal decline; general trade volume is rising nearer to normal levels; and commodity prices have ceased their rapid decline. To carry us beyond the seasonal hump during September, the upturn depends on whether the Federal Reserve will keep the credit clock wound up and whether business brains will jump energetically into the job after Labor Day.—*The Business Week.*

Five-Cent Local Fare Restored in Boston

For an experimental period of 30 days, beginning Sept. 1, the board of public trustees of the Boston Elevated Railway have authorized a reduction in the rate of local fares from 6¼ to 5 cents, without transfers.

The reduction of fare in local fare zones is prompted by the necessity of increasing riding in order to offset, if possible, the loss in riding from the use of the private automobile and present industrial conditions. These two factors together are estimated to have caused a reduction of 1,380,409 revenue passengers, about 5 per cent on the system during July, 1930, compared to July, 1929.

General Manager Dana said:

Under the law, the Boston Elevated must be operated on a service-at-cost basis. A decrease in revenue, due to a reduction in riding, can be met ultimately only through proper economies, or by an increase in the rate of fare, or by increasing riding. A reduction of $2,000,000 in operating expenses during the past three years, resulted in offsetting the reduction in revenues due to the decrease in riding. This reduction in the local fare rate is an effort to increase riding. It is hoped that this change will be successful and that no further adjustment in the rate of fare for local zones will be necessary.

The local rate of fare is of value for short rides throughout the Elevated system. There are 120 routes over which the local rate of fare is in effect. During the year ended Dec. 31, 1929, 56,272,366 passengers were carried at the local rate of fare. This represented almost 16 per cent of the total number of revenue passengers that year.

It is the earnest desire of the trustees to increase riding in local fare zones by offering a fare of 5 cents for such rides. It is hoped that this action will receive the co-operation of the public and that riding will be increased.

The change does not affect the rate of the regular fare or the transfer privileges at the regular fare.

LATE NEWS

(*Continued from Page* 596)

Salt Lake City, Utah.—Trolley buses are to be substituted for trolley cars by the Utah Light & Traction Company on the Capital Street line under an order of the Public Utilities Commission. Service with the new equipment will be in operation from South Temple and Main Streets and to the east side of the Capitol grounds, except during the winter, when the company may restore service by trolley if it so desires.

✦

Los Angeles, Cal.—Permission for the Los Angeles Railway temporarily to discontinue shuttle car operation on Santa Fe Avenue and Mateo Street between First and Seventh Streets and to substitute a bus service in order not to hamper construction of the Fourth Street viaduct has been granted by the Board of Public Utilities.

✦

Columbus, Ohio—Three street cars were destroyed, twenty others were damaged, and the roof burned off the Milo carhouse of the Columbus Railway, Power & Light Company, Aug. 22. The damage to the cars is estimated at $55,000 and to the building at $20,000. The building will be repaired immediately.

✦

Stockton, Cal.—The City Council has adopted the proposed harbor development plan of Colonel Allin, director of the port of Houston, and has authorized City Attorney J. Leroy Johnson to apply to the Interstate Commerce Commission to build a rail extension to the Rough and Ready island area. Thus the city has committed itself definitely to a policy of public ownership and control of railroad facilities' serving the future deep water harbor here.

✦

Springfield, Mass. — The Springfield Street Railway has discontinued bus service between Springfield and Westfield. In 1905 railway service was started between these two cities, but due to lack of revenue cars were withdrawn in 1928. When the new Apremont State Highway was opened only two months ago a bus service was started.

✦

Lawrence, Mass.—The Massachusetts Northeastern Street Railway has been authorized by the Public Utilities Commission to operate buses over twelve routes in Lawrence, Methuen, Merrimac, Amesbury, Haverhill, Salisbury and Newburyport.

✦

New York, N. Y.—The Board of Transportation is pursuing a policy of keeping sidewalks as free of subway entrance encumbrances as possible, especially in congested districts, and has set up a force of engineers to specialize in location and design of such entrances. This policy was applied not only to the new subway system now being built, but to the older lines wherever it was feasible to change locations. As a result, 59 entrances on the new system have been laid out in city parks, malls or through private buildings. In addition to these, 30 stairways that obstructed sidewalks at entrances to existing subways have been relocated on private property.

✦

Gary, Ind.—A new skip-stop system between Broadway and Colfax Street in West Gary and reduced running time between Gary and Hammond is in effect on the Hammond division of the Gary Railways. The skip-stop system eliminates a number of stops through Tolleston and West Gary where city blocks are short and the frequent stops slow up operation. The stops are staggered, eastbound and westbound blocks falling on alternate streets. With the introduction of the skip-stop system and with the improved roadway resulting from reconstruction, running time between Gary and Hammond has been reduced to 45 minutes, five minutes faster than the former schedule.

✦

Lynn, Mass.—The property of the Nahant & Lynn Street Railway, operated between Nahant and Lynn, was purchased at a public auction on Aug. 20, by the Eastern Massachusetts Street Railway for $13,500. The purchase includes the carhouse site, twelve cars and parcels of land along the right-of-way.

✦

Utica, N. Y.—The Public Service Commission has authorized the New York State Railways further to discontinue its shuttle line on Auburn Avenue from the intersection of Genesee Street and Auburn Avenue to the intersection of Prospect Street and Holland Avenue. This further discontinuance is effective until July 1, 1931. Since the suspension of the shuttle line in 1926 the Utica Railway Co-ordinated Bus Line, Inc., has operated buses over practically the same route. The company does not want to abandon the shuttle line altogether because it desires to await the development of the residential section at the end of the line.

✦

Pittsfield, Mass.—The Berkshire Street Railway has applied for a franchise for a cross-over from East Street to West Street here to permit direct connection with the New Haven Railroad, as part of plan of the General Electric Company to lease the route from the Berkshire Street Railway. The General Electric Company plans to direct its freight over the route daily between midnight and 6 a.m.

✦

Chicago, Ill.—The committees appointed to obtain deposit of Chicago Rapid Transit Company securities sent letters on Aug. 18 to all known holders of these securities, requesting deposits. The letters set forth that there is no great hope of an adequate return for the "L" without consolidation with the surface lines, but that with consolidation returns may be materially increased.

✦

Tacoma, Wash.—Bills of the municipal belt line for operation of buses past the obstruction to railroad traffic, caused by reconstruction of the Milwaukee Viaduct, have been passed by the Council at the full figure of $15,498. The bills cover the period of operation of buses from Feb. 10 to May 30, and when the full period of such operation is paid for, the total cost is expected to be $35,000. The cost of bus operation has been a heavy drain on the belt line. The financial straits of the belt line were pointed to as reason for liberal allowance for detouring traffic, and it was also argued, that, as bus service merely in the immediate vicinity of the construction job was impractical in combination with railway service, the belt line had to put in buses to make up the entire run.

✦

Seattle, Wash.—Unable to meet a semi-annual interest and principal payment of $421,360, due Sept. 1, on the purchase bonds, the municipal railway department has petitioned the Council or another loan from city light construction bond funds. The last loan extended to the railway system was from the city water fund, Jan. 1, 1929. It was for $800,000, but has been paid off with funds saved by the two-year moratorium on railway purchase bonds. Meanwhile business and civic leaders demand the withdrawal of the transportation system from politics and the setting up of the system as a separate governmental unit under a non-political commission.

✦

Hamilton, Ont.—The Hamilton Street Railway and the fleet of interurban buses has been offered to the city for $2,500,000 by the Dominion Power & Transmission Company. F. A. Gaby, chief engineer of the Ontario Hydro-Electric Commission, emphasized that the Hydro did not want either the street railway or the buses, but this may not represent the opinion of the full commission.

✦

Holyoke, Mass.—The Holyoke Street Railway proposes to install one-man service on local lines early in September. Veteran employees will be retained according to senority.

✦

Portland, Ore.—The operating department of the Pacific Northwest Public Service Company, has worked out a plan to indicate by colored cards whether a car is a "front" or "rear" entrance car. A bright chrome yellow dash sign on the front of the car indicates "front entrance," loading at the nearside crosswalk. If the dash sign is a rich azure blue in color, that means a "rear entrance" car, and should be boarded on the back platform.

✦

Walworth, Wis.—The Chicago, Harvard & Geneva Lake Railway has applied to the Interstate Commerce Commission for permission to abandon, and sell for dismantling its interurban line between Harvard, McHenry County, Ill., and Fontana, Walworth County, Wis. The company previously has had authorization from the state commission to abandon its passenger service in Illinois. The interurban line's right-of-way is paralleled by a concrete highway on which passenger bus and trucking service is available.

✦

Buffalo, N. Y.—Plans to effect improvements to the Falls View bridge across the Niagara gorge at Niagara Falls, ordered by the Canadian Board of Railway Commissioners are being studied by the engineering staff of the International Railway, owners and operators of the bridge. The commissioners recommend strengthening of the guard rail, the construction of an inner guard rail, the raising of the sidewalks 10 in. above the level of the vehicle section, and the use of a new type of floor construction at both ends of the bridge to prevent skidding when motor cars are halted for customs inspection.

Baltimore Introduces Its New Rolling Stock

First of Order of 150 Cars Placed in Service Under a Rehabilitation Program Following the Recent Favorable Fare Decision

SERVICE with twelve new cars, the first of 150 to be received, was started on Sunday, Aug. 17, by the United Railways & Electric Company of Baltimore on its Madison Avenue line. Modern in their appearance, the cars symbolize the great improvement program instituted by the company, following the favorable fare decision made recently by the United States Supreme Court. The new cars are being delivered as rapidly as possible, and the company expects to have the entire 150 in operation by autumn.

While the cars are designed for one-man, two-man operation, the company started them out with two men, using the conductor as a helper to the operator. Taking a position at the front end of the car instead of at the middle, where the exit is, the conductor assisted the passengers in boarding, made change and instructed them in the use of the fare box. It will thus be possible, when the time comes to run the cars with one man, to do so with less confusion than if the company had started them out as two-man cars, operated on the pay-as-you-pass principle.

Although the weather was rainy and unpleasant most of the day, the line showed an increase in revenue over the corresponding Sunday for last year, when the weather was pleasant. Many favorable comments were made by those who rode on the cars, everyone being highly pleased with the new equipment. Coincident with the inauguration of the vehicles, an editorial, praising the efforts of the United Railways to increase its patronage by betterments, appeared in the Baltimore *Sun*.

Effective publicity for the introduction of the cars was given in a special "New Car" edition of the company's publication, *Trolley News*. Printed in the form of a miniature newspaper and devoted entirely to the cars, the issue proved a valuable means of stimulating interest among the railway patrons. On the first page appeared a feature item, captioned "Better Transporation for Baltimore Is Promised as New Cars Come to Town," and a facsimile of a letter from the president of the Baltimore Association of Commerce, congratulating the company on the new cars and other service improvements. Individual articles contained in the issue described the use of metal, the low step and floor level, the use of stanchions and handholds in place of car straps, the improved heating and ventilation, the effective lighting system, and the mechanical devices assuring safety. The issue also included several illustrations and statistics regarding the new cars.

Of the 150 cars being built, 100 are being supplied by the J. G. Brill Company and 50 by the Cincinnati Car Corporation. Full details of these cars were given in a comprehensive article in the May, 1930, issue of ELECTRIC RAILWAY JOURNAL. The cars are of the double-truck, single-end, front-entrance, center-exit type, with an over-all length of 46 ft. All of the cars



Leather upholstered semi-bucket type seats, and dome lights add to the comfort and convenience of patrons

are being mounted on Brill 177-E-1 trucks with 26-in. rolled steel wheels. Each car will have four 50-hp. motors, either Westinghouse 516-A or General Electric GE-301. Automatic control of the PCM and VA type will be used, to obtain a smooth acceleration of 3.25 m.p.h.p.s. The total weight is 38,933 lb. and the seating capacity 52.



One hundred and fifty cars of this type are being received by the United Railways & Electric Company of Baltimore. The first twelve to arrive were placed in service on Aug. 17

Trailers Dropped on Lorain Avenue Line in Cleveland

An experiment designed to increase street car riding by giving faster and more frequent service has been started by the Cleveland Railway on the Lorain Avenue line, one of the longest in the city.

The principle is the same as that which has been in effect on the Madison Avenue route of the Chicago Surface Lines since July 19; namely, the substitution of single motor cars for trailers during the rush hours.

Under the new schedules of the Cleveland Railway, the headway is reduced from five to two minutes during the rush hours and the running time is cut from 47 minutes to 42 minutes. The base table running time has been reduced from 44 to 39 minutes and the night running time from 40 to 35 minutes.

The use of single-motor cars instead of trailers will increase operating costs, but it is expected the increase will be more than offset by the saving which will result from closing the Lorain Avenue carhouse.

Safety Congress to Meet in Pittsburgh

An interesting program has been provided for the Electric Railway Section of the National Safety Congress and Exposition, which is to meet in Pittsburgh from Sept. 29 to Oct. 3. The address of welcome will be made by Thomas Fitzgerald, vice-president and general manager Pittsburgh Railways. Other speakers will be Charles Gordon, managing director American Electric Railway Association, who takes as his subject, "Improved Public Relations a Result of Safe Operation," and C. H. Evenson, superintendent of transportation Chicago Surface Lines, whose subject is to be "Accident Prevention Through Supervisory Training." L. G. Tighe, assistant general manager Northern Ohio Power & Light Company, Akron, Ohio, will speak on "Experience of a Public Transportation Company in the Prevention of Street and Highway Accidents," and Chester K. Thomas, division superintendent Chicago, North Shore & Milwaukee Railroad, will discuss "How to Operate a Public Vehicle Safely."

Others who will participate include W. J. McCarter, of the personnel department, Cleveland Railway; E. K. Eastham, safety director St. Louis Public Service Company; Glenn Shaw, superintendent department of accident prevention, Northern Ohio Power & Light Company; Edward McCoy, superintendent employment-instruction Public Service Co-ordinated Transport; L. J. Troy, supervisor of safety Boston Elevated Railway; L. D. Voshall, superintendent of equipment Washington Railway & Electric Company, and John C. Baldwin, Pittsburgh Railways.

Engineers Organize to Seek Formula on Suitable Vehicle

An interesting program of activities for the coming association year was outlined at the first meeting of the new executive committee of the Engineering Association, held in New York Aug. 19. Of particular interest was the proposal, tentatively agreed upon after a lively discussion to appoint an independent committee, reporting to the executive committee, to study all factors which must be considered in determining the relative cost of operation of the three types of vehicles, the street car, the trolley bus, and the motor bus, and, if possible, to arrive at a formula which may be applied to select the proper type of vehicle. The personnel of the proposed committee would embrace engineers whose interests cover phases of practice which a problem of this nature involves.

Making convention programs more interesting was the subject of general discussion. Opinion was divided as to the necessity of presenting all committee reports on the convention floor, but it was conceded that if this is done they should be made as brief as possible. There was general agreement on the desirability of having at least one paper or address on a live subject at each meeting. The view was expressed that by outlining definitely to speakers the phases of a subject to be covered an added interest could be secured and a valuable discussion ensured.

Assignments for the coming year were agreed upon, and committee appointments will be sent out soon. A. W. Baker, engineering secretary, reported that the Manual will be ready for distribution in a few weeks. C. R. Harte presented the report of representatives on American Standards Association committees. This is to be published in summary form in the proceedings. Various routine matters were settled and adjournment taken, subject to the call of the president.

Members present at the meeting included President L. D. Bale, C. H. Jones, P. V. C. See, John Fleming, W. H. Wysor, C. R. Harte, E. M. T. Ryder, H. H. George, A. T. Clark and R. C. Cram.

Rerouting Suggested Under Indianapolis Traffic Survey

Proposals for rerouting of street cars in downtown Indianapolis to relieve traffic congestion are under consideration by the Citizens' Traffic Committee in connection with the redrafting of the city traffic code.

Members of the committee believe that the Indianapolis Street Railway can save money and operate more efficiently by establishing through service on the principal lines, thus eliminating numerous turns in the downtown section.

The committee recently announced plans to conduct a survey in co-operation with the Indianapolis Merchants' Association to determine the method of transportation used by shoppers. The count will be taken at a selected group of stores representative of all lines of business in all parts of the business district. Six-pointed question cards will be used, one being given to each customer as he enters the store. Each detachable point will carry a specific statement as to mode of travel in coming downtown. The one fitting the case will be torn off and deposited in a box. The points are: "Came by auto and parked at curb," "Came by auto and parked at parking lot or in garage," "Walked," "Came by trolley," "Came by bus," and "Came by train."

The count will cover an entire business day, from 9 a.m. to 5 p.m. The returns will be collected hourly and counted by hours and by types of businesses where collected.

Segregation Move in Portland, Ore

Paving a way for the Pacific Northwest Public Service Company, Portland, to separate its power and railway business into two operating subsidiary companies, the City Council has passed an ordinance permitting transfer of the existing franchises. The company expects immediately to proceed with plans for the formation of the Portland General Electric Company to take over the power and light franchises and physical property, and the Portland Traction Company to take over the railway.

Present plans involve an adjustment of the capital structures of the proposed companies requiring a vote of the stockholders and it is understood a special meeting of stockholders is to be called shortly.

Segregation is desired to facilitate compliance with the recent order of the Oregon Public Service Commission, and to facilitate negotiations with the City Council on any possible new railway franchises since the city has a "service-at-cost" franchise in preparation for the consideration of the voters probably in November.

Temporary Financing Proposed for Chicago "L"

The Chicago Rapid Transit has asked the Illinois Commerce Commission for permission to issue $6,872,000 of two-year 6 per cent notes at 96 to pay for the cost of construction work and improvements contemplated in the near future under the terms of the recent unification ordinance.

The principal expenditure will be for purchase of right-of-way for two additional tracks on Garfield Park Branch, Marshfield Avenue to Laramie Avenue, which will cost $2,009,000, and for addition of one track, Garfield Park Branch, Laramie to Marshfield Avenue, including realignment through Sacramento station, which will cost $2,517,000.

COMING MEETINGS

Sept. 5-6 — Central Electric Traffic Association, Wawasee, Ind.

Sept. 10-11 — Central Electric Railway Master Mechanics' Association, Miami Hotel, Dayton, Ohio.

Sept. 11-12—Maryland Utilities Association, leaving pier 19, Light Street wharf, Baltimore, Md., at 3 p.m., Sept. 11, for steamship cruise to Jamestown and Yorktown.

Sept. 17-19—Canadian Electric Railway Association, 26th annual convention, Ottawa, Canada.

Sept. 25 — Pennsylvania Street Railway Association, Casey Hotel, Scranton, Pa.

Oct. 9-11 — Midwest Electric Railway Association, Miami, Okla.

Oct. 22-24—National Transportation Meeting of the Society of Automotive Engineers, Pittsburgh, Pa.

Oct. 29-30—Iowa Electric Railway Association, Des Moines, Iowa.

Suburban Rapid Transit Fare Controversy in Cleveland

Discovery that a heretofore overlooked amendment to the Cleveland Union Terminal ordinance of 1919, giving the city the right to control rapid transit fares within a 15-mile radius of Cleveland, has laid the groundwork for a legal battle between the City Council and the Van Sweringen interests who control both the Cleveland Railway and rapid transit operations in the Cleveland territory.

Protests against the 15-cent rate charged by the Cleveland Interurban Railway on the Shaker Heights line led to the discovery that the Van Sweringen interests plan to charge the same fare on the projected East Cleveland rapid transit line, scheduled to go into operation in a few months, and a projected West Side rapid transit line along the Nickel Plate right-of-way, which it is proposed to put into operation next year.

The East Cleveland commission has voted to file a protest against the 15-cent rate of fare on the East Cleveland line, while attorneys for Shaker Heights residents have petitioned the Ohio Utilities Commission charging that legal steps were not complied with in raising the fare from 10 to 15 cents on the Shaker line.

The Cleveland law department called attention to the provision of the old terminal ordinance, under authority of which the Van Sweringen terminal was built, giving the city the right to fix the rapid transit fares within a 15-mile radius of the terminal and also specifying that the city should have the power to fix stops and that any rapid transit lines established under authority of the ordinance should have provisions for transfers between rapid transit and city cars. None of the rights granted under these provisions have ever been exercised. However, any attempt to enforce these provisions probably would lead to suit on the grounds that there is a conflict between the city ordinance and the utility regulations of the state.

Value of Winnipeg Railway Reported

The present value of the railway property of the Winnipeg Electric Company, Winnipeg, Man., is $17,024,658, according to an inventory and appraisal filed with the Municipal and Public Utility Board. To replace the property with new plant would cost $19,596,915. Distribution of value shows that the company's property has a new replacement cost of $18,259,395, but depreciation cuts this figure to $15,892,819. The report allows $1,770,500 for company's intangible assets as a "going value," because of its patronage and earning capacity. Among larger assets are listed 108 miles of single tangent track. The audit was filed in connection with the plans for an increase in fares and reductions in payments to the city.



Veteran prepared to guide visitors to Boston's Tercentenary

Helping Visitors to Boston

The Tercentenary Committee of the city of Boston and the Boston Elevated Railway on Aug. 18 opened an official booth to give visitors to Boston information on events relating to the tercentenary, and also general information relating to places of historical interest, near-by pleasure resorts, means of transportation and any other information that visitors want.

The booth is located adjacent to the memorial shaft and faces directly the main entrance to the South Station. It will be open from 10 a.m. to 6 p.m. on weekdays. Michael J. Dockery is in charge of the booth. He has been in the employ of the Boston Elevated Railway for 34 years, and for the last six years has been one of the information clerks at the Park Street subway station. The location for the booth was granted by the Boston Terminal Co.

New York's New Subway Nears Completion

Prospects point to the completion of construction work on the new Eighth Avenue subway line in New York City in time to permit the beginning of operation in the Fall of 1931. With the exception of three or four short stretches, the basic construction work has been finished from Chambers to 207th Street.

Mayor Walker and his transit advisors, it is known, regard the question of how the new line will be operated as of vital importance in the pending negotiations for unification of the new subway system with the B.-M. T. rapid transit lines. If the Eighth Avenue line is to be operated next year, it must be decided well in advance whether it will be part of a unified system or turned over to municipal operation, or leased to the B.-M. T. as an addition to the city-built lines operated by that company under Contract 4 with the city.

The most recent rumors are that a plan for operation of the new subway system at a 5-cent fare by a corporation whose shares are controlled by the city, obviating municipal operation or lease to existing traction companies, is being considered by city officials. This proposal is contingent on failure of negotiations to buy B.-M. T.

No Zone Fare Cabs in Cleveland

The Cleveland Railway, which opposed the projected invasion of Cleveland by a fleet of low-fare taxicabs and secured a temporary injunction restraining the city from granting the Zone Cab Company a license, has now won a partial victory.

The court has ruled that the cab company may be granted a license, but that it may not operate under its projected zone fare system. Instead, it must conform to the city ordinance and install meters which calculate the fares mechanically. The decision was handed down by Chief Justice Powell of common pleas court.

George D. McGwinn, vice-president of the Cleveland Railway, said:

"Judge Powell's decision prevents the operation of taxicabs on a zone basis. In obtaining this decision, I believe the company has done its full duty by its partner, the city of Cleveland, and by its stockholders."

Officials of the Zone Cab Company announced that meters would be installed and the cabs would go on the streets shortly.

Toledo Displays Its Wares

Transportation progress in Toledo was featured by the Community Traction Company, Toledo, Ohio, in its booth at the recent Toledo Industrial Progress Exposition. At the back of the display was an illuminated map of Toledo's co-ordinated railway and bus system flanked by a series of interesting pictures selling the idea of modern transportation.

Two motion picture machines were in constant operation One showed "The Story of Local Transportation" and the other action pictures in connection with operation and improvement of the railway. Model cars and buses were used to attract attention to modern equipment in use by the company.

Outside the exposition the company had special buses to connect with its main lines in the heart of the business and hotel district, giving an actual demonstration of service.



Effective display of facilities of Toledo Company for serving the public adequately

New Effort to Reach Equitable Philadelphia Value

A checking up and appraisal of the physical assets of the Philadelphia Rapid Transit Company and underliers has been ordered by the valuation committee of Judge McDevitt's General Transit Conference.

J. A. Emery, vice-president of Ford, Bacon & Davis, Inc., and a member of the valuation committee, will be in charge. He will receive the co-operation of Dr. Milo R. Maltbie, public utilities expert, who has been assisting Comptroller Hadley in his P. R. T. audit.

The purpose is to assist the valuation committee in determining a price to be paid by the city for the P. R. T. and the underliers, as recommended by the General Transit Conference.

The valuation committee was created to establish a "fair price" for the entire transit system. Members of the committee are: Judge McDevitt, chairman; Deputy City Comptroller S. Davis Wilson and Mr. Emery. Joseph Wayne, Jr., president of the Philadelphia National Bank, was named as the fourth member, but resigned because of the press of other business.

At the meeting at which decision to embark upon the appraisal was reached it was agreed that hearings will be resumed in mid-September in the city's equity suit against P. R. T. and the Mitten interests for alleged violations of the 1907 city-P. R. T. transit agreement.

Hearings in the city's suit were suspended in January to permit a survey of the transit situation by a conference of city officials and P. R. T. representatives in order to solve the tangled transit situation.

Upon organization the members of the conference which has come to be known as the General Transit Conference designated four experts to make a survey of the transit situation and to report a plan for its solution. Dr. Maltbie, representing Comptroller Hadley; Mr. Emery, representing Mayor Mackey; Solomon M. Swaab, acting for City Council, and W. K. Myers, vice-president of Mitten Management, Inc., for the transit interests, were the four selected. Their survey crystallized in a plan that the city purchase the entire transit system at a "fair price" as the only possible solution of the muddled transit situation.

They pointed out that at a price of $150,000,000 the city would save $7,319,365 annually in operating the transit system. A price of $200,000,000 would result in a saving of $4,644,635 annually, the experts reported.

Subsequently, Comptroller Hadley announced that he would not approve payment of a price in excess of $150,000,000, while sources close to the P. R. T. and underliers indicated that the minimum acceptable price would be $175,000,000.

It was at this point that the valuation committee was delegated to fix a "fair price" acceptable to both the city and the P. R. T. and underliers. In announcing the new check-up Judge McDevitt said:

> We have concluded that we cannot reach a proper determination as to price until a check-up appraisal of the physical assets of the P. R. T. and underliers is completed.
>
> The data to be gathered in such a check-up appraisal will supplement the facts already before the valuation committee. Once this new information is available we will then be in a position to make a report to the general transit conference.
>
> It is our opinion that we will not be in a position properly to discharge our task until the most complete information as to every phase of the transit situation is accurately collated and digested.
>
> In a matter of such vital importance every possible step should be taken to determine the value of the physical assets as well as the earning capacity, present and potential, of the transit system.
>
> The cost of the work will be insignificant in comparison to its tremendous value and importance.

"Faster than We Build Them in New York"

The Chicago Board of Local Improvements has adopted a resolution ratifying the appointment of employees of the advisory subway commission and approving delayed payrolls for these employees. The recent opinion of Corporation Counsel Ettelson that the board should have a governing hand in subway construction was thus carried into effect.

Some authorities in Chicago are holding that substantial improvement in transportation will come before a subway is available. In this connection Alonzo J. Hammond, a prominent engineer, has proposed a plan whereby the capacity of the present "L" structure in the Loop can be doubled by utilizing the Loop structure differently.

When asked whether Chicago's new subway would be ready for the World's Fair in 1933, Robert Ridway, chief consulting engineer, said: "That's faster than we build them in New York."

Seattle Municipal Having Its Troubles

(*Continued from page 597*)

tracks, paying all but $153,000 of this amount out of the city's general budget. He also favors a straight city bond issue of $1,500,000 to provide funds to "buy fast, modern street cars, upholstered and comfortable to ride in."

Another problem is the one of pensions. To settle this matter voters may be asked to decide whether the civil service pension system, now applying to all employed outside the police and fire departments, shall be abandoned so far as the railway is concerned, or whether the railway department's present contribution to the fund shall be assumed by the city taxpayers.

The railway, light and water departments are now matching their employees' contribution to the pension system out of their utility earnings. In view of the railway department's present financial embarrassment, it probably will not be able to continue its pension contributions out of earnings with the extra burden, also, of the 44-hour week and the 4-cent-per-hour increase in wages granted to the railway employees a year ago. The railway's pension requirements for 1931 will amount to $150,000, while the 44-hour week is costing about $45,000 a year and the 4-cent increase about $80,000 a year, all to come out of current earnings even now inadequate.

Conspectus of Indexes for August, 1930

Compiled for Publication in ELECTRIC RAILWAY JOURNAL by

ALBERT S. RICHEY

Electric Railway Engineer, Worcester, Mass.

	Latest	Month Ago	Year Ago	Last Five Years	
				High	Low
Street Railway Fares* 1913 = 4.84	Aug., 1930 **7.99**	July, 1930 **7.97**	Aug., 1929 **7.76**	Aug., 1930 **7.99**	Aug., 1925 **7.28**
Electric Railway Materials* 1913 = 100	Aug., 1930 **134.2**	July, 1930 **136.2**	Aug., 1929 **146.4**	Dec., 1926 **159.2**	Aug., 1930 **134.2**
Electric Railway Wages* 1913 = 100	Aug., 1930 **231.8**	July, 1930 **231.7**	Aug., 1929 **231.0**	Aug., 1930 **231.8**	Aug., 1925 **222.6**
Electric Ry. Construction Cost Am. Elec. Ry. Assn. 1913 = 100	Aug., 1930 **195.9**	July, 1930 **197.7**	Aug., 1929 **200.8**	Nov., 1928 **205.7**	Aug., 1930 **195.9**
General Construction Cost Eng'g News-Record 1913 = 100	Aug., 1930 **201.0**	July, 1930 **201.0**	Aug., 1929 **205.9**	Jan., 1927 **211.5**	July, 1930 **201.0**
Wholesale Commodities U. S. Bur. Lab. Stat. 1926 = 100	July, 1930 **84.0**	June, 1930 **86.8**	July, 1929 **98.0**	Nov., 1925 **104.5**	July, 1930 **84.0**
Wholesale Commodities Bradstreet 1913 = 9.21	Aug., 1930 **10.45**	July, 1930 **10.56**	Aug., 1929 **12.63**	Dec., 1925 **14.41**	Aug., 1930 **10.45**
Retail Food U. S. Bur. Labor Stat. 1913 = 100	July, 1930 **144.0**	June, 1930 **147.9**	July, 1929 **158.5**	Nov., 1925 **167.1**	July, 1930 **144.0**
Cost of Living Nat. Ind. Conf. Bd. 1914 = 100	July, 1930 **152.4**	June, 1930 **154.8**	July, 1929 **161.6**	Nov., 1925 **171.8**	July, 1930 **152.4**
Industrial Activity Elec. World, kw.-hr. used 1923-25 = 100	July, 1930 **105.1**	June, 1930 **115.5**	July, 1929 **129.2**	Feb., 1929 **140.4**	Aug., 1925 **94.3**
Bank Clearings Outside N. Y. City 1926 = 100	July, 1930 **91.6**	June, 1930 **92.1**	July, 1929 **107.8**	Oct., 1929 **111.8**	July, 1930 **91.6**
Business Failures Number	July, 1930 1930	June, 1930 1874	July, 1929 1570	June, 1930 1874	Sept., 1928 1348
Liabilities, Millions of Dollars	**72.21**	**114.40**	**104.70**	**114.40**	**23.13**

*The three index numbers marked with an asterisk are computed by Mr. Richey, as follows: Fares index is average street railway fare in all United States cities with a population of 50,000 or over except New York City, and weighted according to population. Street Railway Materials index is relative average rice of materials (including fuel) used in street railway operation and maintenance, weighted according to average use of such materials. Wages index is relative average maximum hourly wage of motormen, conductors and operators on 136 of the largest street and interurban railways operated in the United States, weighted according to the number of such men employed on these roads.

City Begins to Realize on Its Rapid Transit Investment

New York City's entire bonded investment in the Interborough Rapid Transit system, totaling more than $163,000,000, is on a self-supporting basis for the first time since the signing of the dual subway contracts in 1913. The immediate result will be to reduce by at least $5,500,000 the debt-service item in the city's budget for the coming year.

Under the 1913 contract with the Interborough, by which the city contracted to build the lower west side line, the upper east side line and the Brooklyn extensions, the city issued bonds totaling $104,000,000 for its share of construction work. The city was to receive a return of 8.76 per cent on its investment, after the Interborough had deducted enough to cover its rental of $2,600,000 a year for the old subways, its interest on bonds, operating expenses and a preferential of $6,335,000 a year.

For years after the entire system was in operation deficits in the Interborough's preferential, which comes ahead of the city's return, prevented the receipt by the city of any sum at all on its investment. As a result the city had a frozen credit of $104,000,000 in the system, with $5,250,000 going into the budget each year to pay the carrying charges on the bonds, plus an even larger amount to carry the $166,000,000 the city invested in the B.-M.T. system, where a similar financial situation has prevailed.

BOOK REVIEWS

Co-ordinated Transportation

"Co-ordinated Motor - Rail - Steamship Transportation." By G. Lloyd Wilson, Ph.D., Professor of Commerce and Transportation, Wharton School of Finance and Commerce, University of Pennsylvania. D. Appleton & Company, New York. 228 pp., illustrated. Price $3.50.

The thesis presented and supported in this book is that the interest of the shipper, carrier and public are best served if each transportation agency is used in the service to which it is especially adapted and for which it is most efficient and economically equipped. Significance of co-ordinated transportation is described in detail in the first chapter and attention is called to the fact that all transportation agencies have a common interest. This, however, does not necessarily have to be identical. Having discussed the transportation facilities, the author also looks at the terminal problems because here all transportation begins and ends and much of the efficiency and speed of haulage depends upon the management and equipment of the terminal, whether for passenger or freight purposes. Terminal arrangements in New York, Chicago, Boston, St. Louis and Cincinnati, are adequately described, and terminal systems in England and Canada are discussed also. Important problems such as store-door freight service and co-ordinated motor-rail passenger service are treated adequately, while the various layouts of system are illustrated to give the reader a better understanding of the different phases of co-ordinated transportation discussed.

High-Voltage Oil Circuit Breakers

By Roy Wilkins, consulting engineer Pacific Electric Manufacturing Company, and E. A. Crellin, assistant engineer, division of hydroelectric and transmission engineering, Pacific Gas & Electric Company. Published by the McGraw-Hill Book Company, Inc., New York, N. Y. 296 pages, 121 illustrations, price $4.

This volume brings together all the major facts concerning the characteristics and advantages of the principal types of oil circuit breakers.

The authors have set forth in their book a chronological account of the development of the high-voltage oil circuit breaker, a discussion of the theory of its action, descriptions of modern forms and an account of the results of many field tests.

Descriptions of the modern high-voltage oil circuit breakers are given in considerable detail. Recent developments in operating mechanisms designed to meet the demands for greater speed and better control are presented and discussed. Field tests of performance of a number of different breakers are presented and reviewed. The tests made with relatively high charging current are particularly interesting, since such conditions can be obtained only in the field. The authors have treated their subject largely from the standpoint of the user, but the viewpoint of the manufacturer has not been overlooked.

Problems in Public Utility Management

By Philip Cabot, professor of public utility management, and Deane W. Malott, assistant professor of public utility management, Graduate School of Business Administration, Harvard University. Published by the McGraw-Hill Book Company, Inc., 628 pages. Price, $6.

The book consists of a varied selection of cases prepared under the supervision of the department of public utility management, of the Graduate School of Business Administration, Harvard University, from printed reports of court and commission decisions and from information supplied to the authors by the officers of public utility companies. These problems have been selected and prepared primarily for teaching purposes. Nevertheless, public utility officials and their lawyers will find the treatment of the problems by the case method of great interest and value.

The book consists of four divisions, each with an introduction by the authors, setting forth the principles supported in the cases. The readings of the treatment is as follows:

I. Characteristics of a Public Utility.
II. Valuation, Depreciation and Fair Return.
III. Marketing.
IV. Finance.

The authors have assumed the belief that the most urgent engineering problems of public utility management have been solved and that the major task during the next generation will be that of marketing the products of the utility companies. For this reason, they have placed emphasis on the economic rather than on the engineering or administrative side, in demonstrating the complexity of the marketing problems and how the difficulties of public utility rate-making are further complicated by the regulation of prices by state commissions.

Public Utility Control in Massachusetts

By Irston R. Barnes, Yale University. Yale University Press. 1930. 239 pages. Price $3.

Professor Barnes gives the results of an investigation of the practical application of the doctrine of prudent investment theory to the problems of rate regulation. Massachusetts was selected for the study, and the book gives the first compilation of the laws and all the reports of the state. The chapters deal with: the development of regulatory machinery in Massachusetts; statutory control over security issues; statutory control over rates; rate regulation under the federal rule, the investment theory, and the Massachusetts policy; critical appraisal of public utility regulation in Massachusetts.

A Traffic Control Plan for Kansas City

"An Outline of Principles and Practical Methods for Traffic Control of Value to all American Cities." By the Albert Erskine Bureau, Harvard University, Miller McClintock, Director, Civic Department, Chamber of Commerce, Kansas City, Mo. 272 pages, 57 illustrations and charts and 24 tables. Price, $5.

The report shows how the standards and recommendations developed by the National Conference on Street and Highway Safety may be adapted for use in a city with average traffic problems. The report has been prepared with a view, not only of developing a constructive plan of traffic control for Kansas City, but also of presenting principles of traffic relief valuable in any city where problems of street congestion and traffic hazards exist. Numerous graphs and charts are used to portray the findings of the survey. Many of these charts are of an entirely different nature from those used in any similar report previously issued.

Mr. McClintock regards the report as one of the best and, in many ways, the most interesting report on street traffic planning which the Erskine Bureau has yet prepared. While it was compiled primarily for the relief of local street traffic problems, it should be of value to public officials and others interested in traffic conditions in any city. The bureau tried to a greater extent than ever before to use the pictorial or graphic method in presenting essential facts and conclusions. This accounts for the large number of plates included. These should make the work of particular value in other cities, as they reveal in a simple manner the technique which was used. Moreover the book contains a number of new studies never before undertaken in connection with street traffic planning. Among these the exhaustive analysis of retail store sales in relation to various types of transportation patronage should be of special interest.

PERSONAL MENTION

Personnel of Successor Company in Indiana Announced

Henry Bucher, L. M. Brown and J. A. Greenland All Elevated to Important Posts with Indiana Railroad, Now Operating Former Lines of Union Traction

ROBERT M. FEUSTEL, executive vice-president of the Midland United Company and president of the newly organized subsidiary Indiana Railroad, which has assumed control of the properties of the Union Traction Company of Indiana, has announced the appointment of the following officials of the Indiana Railroad and other interurban electric railway lines under the same co-ordinated management:

Henry Bucher, who is manager of the railway department of the Indiana Service Corporation, Interstate Public Service Company and co-ordinated companies, will be vice-president and general manager of the new company in charge of operations.

W. A. Sauer, vice-president, will have general supervision of accounting and financial matters. Walter Shroyer will direct the accounting work, reporting to E. J. Booth, comptroller.

L. B. Andrus, power executive of the Midland United Company, will have charge of the operation of all power stations, substations and transmission lines. F. L. Ray, superintendent of power plants, and J. O. Peniston, superintendent power distribution, will report to Mr. Andrus.

L. M. Brown, general manager of the Interstate Public Service Company railway department, will be general superintendent of interurban lines of the Indiana Railroad as well as the Interstate Public Service Company, Indiana Service Corporation, and Northern Indiana Power Company. C. C. Lentz, superintendent of transportation, will report to Mr. Brown.

J. A. Greenland, who has been superintendent of transportation of the Indiana Service Corporation at Fort Wayne, will be general superintendent of city lines in charge of local operations of the Indiana Railroad at Anderson, Marion and Muncie; of the Indiana Service Corporation at Fort Wayne, Wabash, Peru and Logansport; of the Interstate Public Service Company at Coumbus, Jeffersonville and New Albany, and of the Northern Indiana Power Company at Kokomo.

W. L. Snodgrass, superintendent of traffic of the Indiana Service Corporation, will be general superintendent of traffic of the Indiana Railroad and co-ordinated systems. C. D. Hardin, traffic manager of the Interstate Public Service Company, and F. D. Norveil, general passenger and freight agent of the former Union Traction Company, will report to Mr. Snodgrass.

H. V. Norford, formerly superintendent of maintenance of way of the Indiana Service Corporation, Fort Wayne, will be general superintendent of maintenance of way of the Indiana Railroad and co-ordinated lines. L. A. Mitchell, engineer of maintenance of way, will report to Mr. Norford.



Henry Bucher

Heber LaMonte will be superintendent of motive power of the joint properties, reporting to Mr. Bucher.

E. E. Slick, claim adjuster of the former Union Traction Company, will continue in that capacity, also reporting to Mr. Bucher.

Headquarters in Indianapolis

Operating headquarters of the Indiana Railroad and other lines under the same management will be located in the Traction Terminal Building in Indianapolis. Only the auditing department and division operating staff of the Indiana Railroad will remain in Anderson, Ind., where general offices of the Union Traction Company formerly were located.

With the transfer of the properties of the Union Traction system to the Midland United Company, Harry A. Nicholl, general manager of the Union Traction for 25 years, and C. S. Keever, superintendent of transportation for the past ten years, resigned.



L. M. Brown

J. E. Cullen in Special Baltimore Post

John E. Cullen, who was with the United Railways & Electric Company, Baltimore, Md., from 1918 to 1922, has been appointed technical adviser to the company. Mr. Cullen does not become a member of the company, but will devote a part of his time to the work. President Storrs explained that because of Mr. Cullen's intimate knowledge of conditions in Baltimore and his experience in the utility field be can be of great help on many subjects.

Mr. Cullen has spent many years in the newspaper field, beginning his career in Baltimore. He became managing editor of the *Evening Sun* and later was advertising and business manager of the *New York Mail*. After leaving the United Railways & Electric Company in 1922 he joined the Hearst organization and took charge of the concern's publications in various cities. On two occasions he was publisher of the Hearst newspapers in Baltimore. He also was a member of the general management staff of the Hearst organization.

Several months ago Mr. Cullen entered the investment brokerage business at the head of Cullen & Company, Baltimore.

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J. F. Gardiner Publicity Manager for Byllesby

J. F. Gardiner has been appointed advertising and publicity manager of H. M. Byllesby & Company, Chicago.

T. P. Pfeiffer has been appointed advertising manager of the Byllesby Engineering & Management Corporation and Standard Gas & Electric Company.

J. W. Hicks has been appointed publicity director of the Byllesby Engineering & Management Corporation and Standard Gas & Electric Company, also remaining in charge of the publications of these companies issued for executives and employees.

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Mr. Mahaffie With I.C.C. Eight Years

Charles Delahunt Mahaffie, appointed by President Hoover to fill the vacancy on the Interstate Commerce Commission caused by the resignation of Commissioner Thomas F. Woodlock, has been connected with the commission since 1922, chiefly as director of the bureau of finance.

Mr. Mahaffie was born in Olathe, Kan., in 1884. He received an A.B. degree from Kingfisher College in Oklahoma in 1905, and was a Rhodes scholar from Oklahoma at Oxford University, England, from 1905 to 1908. From 1908 to 1909, he was instructor of jurisprudence at Princeton University, and later practiced law in both Oklahoma and Oregon. He entered the government service in 1916 as solicitor of the Department of the Interior, and from 1921 until he joined the commission he was an attorney for the United States Railroad Administration.

Commissioner Thomas F. Woodlock, Mr. Mahaffie's predecessor, was appointed to the commission by President Coolidge in 1925. He was serving his first term, which would have expired on Dec. 31 of this year.

A. R. Hanbury New Assistant Engineer Way and Structures

Arthur R. Hanbury has succeeded H. W. Smith as assistant engineer of the way and structures department of the Kansas City Public Service Company. He has been a member of that organization since May, 1927, when he went to Kansas City as an engineering representative of the William G. Woolfolk Company, for which he inspected and supervised the roadway rehabilitation then in progress. Upon its completion in March, 1928, he was made assistant to John V. McKinney, the executive vice-president of the company.

Prior to becoming a member of the Kansas City railway organization, Mr. Hanbury was associated with various engineering enterprises. During the World War he served with the expeditionary forces in France, being attached to the



A. R. Hanbury

engineer unit, and when peace was declared he had attained a grade of master engineer in the Rainbow Division.

In July, 1919, he became associated with the Southern Pacific Railway as assistant engineer in survey work in California. When this work was successfully finished in 1921 he entered the service of the Illinois Central Railroad as an assistant engineer. This position he relinquished to engage in railroad location work for the Soviet Government in Russia.

Upon his return from Russia Mr. Hanbury became connected with the William G. Woolfolk Company, Chicago. He proved himself so valuable in his work for this company that at the completion of the rehabilitation of the railway he was transferred to the Kansas City Public Service Company as assistant to the executive vice-president.

Arthur R. Hanbury was born in Chicago on June 13, 1897. He was educated in the grade schools of Chicago and was graduated from the Carl Schurz High School of that city. Later he attended Lewis Institute, also of Chicago.

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New Officials in Spokane

Frank T. Post was elected president, J. E. E. Royer, general manager, and R. B. Childs, assistant general manager, respectively, of the Washington Water Power Company, Spokane, which controls the Spokane United Railways, at a meeting of the members of the board of the trustees held Aug. 4 in New York.

Mr. Post has been chief counsel of the Washington Water Power Company since 1909, and a vice-president since 1926. He succeeds as president D. L. Huntington, who died last September. Mr. Royer entered the employ of the company in 1907 and became assistant general manager on Nov. 1, 1924. He succeeds the late Miles W. Birkett. Mr. Childs has been a commercial engineer with the company since 1923 and previous to that was in the employ of the Montana Power Company. He was a captain in the 363rd infantry of the 91st division in the World War.

L. W. Chubb to Direct Westinghouse Research

L. W. Chubb, former manager of the radio engineering department of the Westinghouse Electric & Manufacturing Company, has returned to the company as director of the Westinghouse Research Laboratories. For some months past Mr. Chubb had been located in Camden, W. Va., as assistant to the vice-president of the Radio Victor Company. Mr. Chubb is filling the position left vacant by the promotion of S. M. Kintner to assistant vice-president.

H. A. Nicholl Resigns from Indiana Union Traction

WITH the resignation on Aug. 1 of Harry A. Nicholl, general manager of the Union Traction Company of Indiana for the past 25 years, one of the most prominent and experienced figures in the electric railway industry retired. Extensive and varied business interests require his attention in Indianapolis and Anderson, and Mr. Nicholl does not expect to re-enter the electric railway field for the present. He will continue to reside in Anderson with his wife and family of two daughters. His only son, Thomas H. Nicholl, recently was made superintendent of shops of the Cleveland Railway, Cleveland, Ohio.

The measure of Mr. Nicholl's contribution to the thought of the industry is reflected not only in his work for the Union Traction Company but by his activities in association affairs. He has participated in the work of the American Electric Railway and Central Electric Railway Associations, and in the Central Electric Traffic Association almost since its inception. He was second president of the C.E.T.A., and in 1915 was chairman of the transportation and traffic committee of the C.E.R.A. Since that time he has served in various executive capacities with all three associations, having been chairman of the executive, pick-up and delivery, finance and constitution and by-laws committees of the C.E.R.A. and a member of the rules, insurance and other committees of the A.E.R.A.

Mr. Nicholl has devoted more than 40 years of his life to every phase of the steam and electric railway business. Following in the path of his father, who was a civil engineer with the Illinois Central Railroad, Mr. Nicholl began his career in the late '80's as a transitman for the Chicago & Northwestern Railroad at Chicago. During the next few years he successively held the positions of yard clerk, baggage-master, freight and passenger agent with the Northwestern system and the Illinois Central Railroad, and finally as assistant general freight agent of the Natchez, Columbus & Eastern Railway, a subsidiary of the Illinois Central in the South.

In 1895 Mr. Nicholl withdrew from the steam railway field to become vice-president and general manager of the North Chattanooga Street Railway and Chattanooga & Northside Railway at Chattanooga, Tenn. Three years later he became connected with a financial syndicate



H. A. Nicholl

controlling the Rochester (N. Y.) Railways (now the New York State Railways) as purchasing agent and superintendent of motive power. While occupying these positions he also had charge of construction of the Rochester & Sodus Bay Railway, connecting Rochester with summer resorts on Lake Ontario.

In 1900 he was made manager of the Taunton Street Railway, Taunton, Mass., but the following year he went to Ithaca, N. Y., as general manager and treasurer of the Ithaca Street Railway. After serving in this capacity for two years, Mr. Nicholl joined the Cleveland & Southwestern Railway as general manager. In 1905 he left this company to go to Anderson, Ind., as general manager of the Indiana Union Traction Company, succeeding A. L. Drum, now president of the Eastern Michigan Railways. He was simultaneously named president of the Traction Light & Power Company, a subsidiary serving 50 small communities located along the railway lines and adjacent to them.

At the time Mr. Nicholl entered its employ, the Indiana Union Traction was only two years old, having been incorporated in 1903 as a consolidation of the Indianapolis Northern Traction Company extending from Indianapolis to Peru and other small lines connecting Marion, Muncie, Anderson and Indianapolis. The company was reorganized in 1912 as the Union Traction Company of Indiana, but by purchase and construction was subsequently increased to a system with more than 450

miles of track, making it at that time one of the largest interurban electric railway systems in the world.

For many years the railroad enjoyed a profitable business, but under the pressure of paved roads and mounting automobile competition, its revenues began falling off in 1921, and in 1924 Arthur W. Brady, its former president, was appointed receiver. Extensive improvements were effected during the receivership, including the purchase of new all-steel passenger coaches and parlor-buffet cars, but operating deficits continued to grow, until on July 2 of this year the road was sold at public auction to the Midland United Company, Chicago, which controls the Interstate Public Service Company, Indiana Service Corporation and other electric railways serving central and southern Indiana. When the receivership was dissolved and the property was deeded to its new owners, Mr. Nicholl resigned his position as general manager.

Mr. Nicholl was born in 1862.

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S. Johnson, Jr., Bendix-Westinghouse Chief Engineer

S. Johnson, Jr., has been appointed chief engineer of the newly formed Bendix-Westinghouse Automotive Air Brake Company at Pittsburgh. In assuming his new responsibilities, Mr. Johnson has, as a background, many years of service and a broad experience in automotive circles.

Last July Mr. Johnson went to Pittsburgh as general engineer for the automotive division of the Westinghouse Air Brake Company. Previous to this time he had served successively in the capacity of inspector, mechanical expert, assistant district engineer, and service engineer over a period of six years, during which time he was identified with the Chicago office of the automotive brake division.

Mr. Johnson is a recognized authority on air brake equipment as applied to modern automotive transportation and is widely known by those closely associated with the industry. He was graduated from the University of Michigan with the degree of mechanical engineer.

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J. Franklin Pond Made Manager at Petersburg

J. Franklin Pond, for many years superintendent of the Petersburg division of the Virginia Electric & Power Company system, has been promoted to manager of the Petersburg and Hopewell division of the company. Mr. Pond joined the company in July, 1903, as time keeper on construction work. Since that time he has worked his way up through the various branches of both the transportation and the light and power departments.

Simultaneously with his own promotion, Mr. Pond has announced the following changes in the staff of the Petersburg and Hopewell division:

C. L. Longanecker, who joined the organization in December, 1925, as distribution engineer, has been made superintendent of the electric department.

J. J. Duell, who entered the service in 1903, leaves his position as railway and bus dispatcher to become superintendent of the transportation department.

R. M. Bush, who joined the organization as a draftsman, and who has been assistant distribution engineer since June, 1929, has been promoted to distribution engineer.



T. R. Langan

T. R. Langan Promoted by Westinghouse Company

C. E. Stephens, vice-president, Westinghouse Electric & Manufacturing Company, announced, on Aug. 10, the appointment of T. R. Langan as assistant northeastern district manager of the Westinghouse organization.

Mr. Langan has been with the Westinghouse company for more than twenty years. Starting as an apprentice in the engineering department, he advanced through the construction, service and sales departments of the company to the office of manager of the transportation division of the Northeastern District which office he held at the time of his promotion. He has been identified with the major high-voltage alternating-current railroad electrifications in the United States, and when the New York, New Haven & Hartford Railroad system was electrified, Mr. Langan acted in a supervisory capacity on this installation for three years.

Before going to the New York office, Mr. Langan served the Westinghouse company in Philadelphia, Baltimore, Buffalo and was manager of the Syracuse office.

Mr. Langan will make his headquarters at New York. He will continue to function as manager of the transportation division of the northeastern district.

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Well-Known Engineer With Fairmont Railway Motors

H. W. Protzeller has been appointed engineer of maintenance of equipment of the Fairmont Railway Motors, Inc., Fairmont, Minn., makers of section motor cars and an extensive line of other railway supplies. He has long been connected with electric railway work, specializing in railway maintenance equipment and labor-saving devices for handling railway roadbed problems. In the past ten years he has been granted 42 patents on equipment of this kind.



H. W. Protzeller

Mr. Protzeller was graduated from Lehigh University, specializing in electrical and mechanical engineering. This training he supplemented by taking the graduate test course of the General Electric Company. With the General Electric Company he spent several years in the construction department installing railway equipment. He served as assistant superintendent of the Twin City Rapid Transit Company at Minneapolis for three years, and as general superintendent of transportation of the St. Mary's Traction Company at Sault Ste. Marie, Mich., and Ontario.

Following two years at Sault Ste. Marie, he served another two years as consulting engineer for electric railways in Minnesota, Michigan, and Illinois. He assisted in organizing and helped to build the Minnesota Northwestern Electric Railway, and operated that property as general manager for eight years. More recently he has acted as development engineer of the O. F. Jordan Company, East Chicago, Ind. His service with that company covered a period of six years.

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John F. McCabe Relinquishes His Springfield-Worcester Duties

John F. McCabe, purchasing agent for the Springfield and the Worcester Consolidated Street Railways, has completed his service for the companies, with the discontinuance of the companies' purchasing departments and the combining of their functions with those of the New York, New Haven & Hartford Railroad in New Haven. His assistant, James E. Meehan, is being transferred to the purchasing offices in New Haven.

Mr. McCabe had been in electric railway work for nearly 40 years. He started as clerk in the storekeeper's department of the West End Street Railway in Boston in 1891. From there he was transferred to the auditor's office and later to the president's office. From 1893 to 1901 he was in charge of the department of tracks, accounts and division correspondence.

On leaving the company at Boston he became chief clerk to R. T. Laffan, general superintendent of the Worcester Consolidated Street Railway, and in 1920 he was given the title of purchasing agent. Later the purchasing activities of the Worcester and the Springfield companies were concentrated in Springfield.

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P. S. Arkwright Heads N.E.L.A. Policy Committee

P. S. Arkwright, president of the Georgia Power Company, Atlanta, Ga., has been reappointed chairman of the public policy committee of the National Electric Light Association. Mr. Arkwright first was appointed to the chairmanship of this committee by M. S. Sloan, former president. As chairman of the public policy group, Mr. Arkwright has an important part in the affairs of the association. During the past year, the task of the committee was exceptionally difficult, and Mr. Arkwright's reappointment is regarded as a distinct honor. Mr. Arkwright was formerly president of the association.

W. B. Spencer in New Post at Providence, R. I.

William B. Spencer, director of public relations for the United Electric Railways, Providence, R. I., is also to fill the newly created post of traffic manager. Mr. Spencer will have full charge of the operation of the transportation department.

G. B. Merchant, paymaster, and R. H. Matthews, tax agent, have been retired on pension by order of the board of directors. Both have served the company many years.

The office of general superintendent of transportation is abolished and the incumbent, J. A. Lockhart, has been made assistant claim agent. He will continue as head of the operating staff.

R. W. Hayward, formerly associated with the claim department, is appointed safety manager.

A department of research is created, and H. S. Thorsen, supervisor of schedules, is made a member of the new department.

Mr. Spencer has been prominently identified with many local civic projects, having served as president of the two largest civic clubs in Providence. He is also well known locally as a public speaker. He has a long record of service with the United Electric Railways, having entered the service of its predecessor, the Rhode Island Company, on Aug. 7, 1907, as office boy in the accounting department.

After that he was successively night clerk at one of the carhouses, clerk in the main office of the transportation department (working as both motorman and conductor in his spare time, to round out his street railway experience). In 1913 he was appointed chief clerk in the transportation department. The same year, he was also placed in charge of publicity and public relations, as assistant to the president, but in 1928 was appointed executive



W. B. Spencer

assistant to the vice-president and general manager carrying responsibility for publicity, public relations, safety and other matters.

To help fit himself for his successive promotions Mr. Spencer supplemented his early schooling by attending business college and by taking extension courses at Brown University, so directing his studies along cultural and practical lines as to stand him in good stead in his work with the railway.

From office boy in 1907 to executive in 1930 at the age of 37 and in a period of 23 years is Mr. Spencer's record, the more remarkable because of the wide range of his work and the exacting nature of many phases of it.

✦

Thomas H. Nicholl Now In Important Cleveland Post

Thomas H. Nicholl, who succeeds Terance Scullin as superintendent of buildings and equipment of the Cleveland Railway, Cleveland, Ohio, joined the research department of the company at Cleveland in 1929. Before that he had been superintendent of motive power of the Union Traction Company of Indiana.

From September, 1914 to 1916, Mr. Nicholl was engaged as light and power solicitor with the Traction Light & Power Company, Anderson, Ind. In May, 1917, during the World War, he entered the First Army Officers Training Camp at Fort Benjamin Harrison. Upon completion of this training course he received a commission as Captain of the Tenth United States Infantry, where he served through the duration of the war.

Mr. Nicholl's first position upon leaving the army was with Ball Brothers, Muncie. He next was employed as manager of the Komo Chemical Company, Kokomo, where he remained until his resignation in August, 1922, to accept a posititon as acting superintendent of motive power with the Union Traction Company of Indiana, in which capacity he continued until he joined the railway in Cleveland. During the past year or two Mr. Nicholl has been active in the Central Electric Master



T. H. Nicholl

Mechanics Association, being its first president. Subsequently he served as chairman of the standardization committee and as a member of the handbook committee of that organization.

Mr. Nicholl was born at Baltimore, Md., on Dec. 11, 1893. He was educated at the University of Michigan.

OBITUARY

W. N. Ryerson

William Newton Ryerson, president of the Trojan Engineering Corporation, New York, and a director of the People's Light & Power Corporation, New York, died recently. Mr. Ryerson was born in New York City, Dec. 7, 1874. Following his graduation from the Columbia School of Mines, he entered the employ of the Sprague Electric Elevator Company, Bloomfield, N. J., serving on electrical testing and drafting from November, 1896, to January, 1898. In the same year, 1898, he worked as draftsman for the Western Electric Company, New York, and as assistant to the chief engineer of the Waldorf Astoria Hotel.

In October, 1898, he became associated with the Metropolitan Street Railway, New York, on construction and power work and substation operation, but resigned from the company in June, 1901, to go with the Manhattan Railway as chief operator of its steam electric generating station. His chief interest at that time was electric railways and subways. In October, 1901, he became superintendent of the substations for the Interborough Rapid Transit. In 1905 he was made assistant superintendent of construction for the Niagara Construction Company, and later in the same year, superintendent of construction for the Ontario Power Company, Niagara Falls, Ont., a position he held until January, 1909.

It was then that he became general manager and chief engineer, and also a director of the Great Northern Power Company, Duluth, Minn. He was in this position more than thirteen years. About the time the Duluth properties were acquired by the Electric Bond & Share Company, Mr. Ryerson left to form a connection with Day & Zimmermann of Philadelphia, as assistant manager of the public utility management department, where he supervised the details of operation of all the utility properties, budgets, new business, rates, public relations, accounting and major construction progress.

In January, 1925, the United Gas Improvement Company of Philadelphia, made him assistant to vice president, in charge of operations and engineering. When the Trojan Engineering Corporation was organized in September, 1928, Mr. Ryerson became its president, which position he held at the time of his death.

✦

H. R. Wair

Harry R. Wair, vice-president and general counsel for the Northern Indiana Railway, Inc., South Bend, Ind., died July 11. Mr. Wair had been legal counsel for the street railway and interurban properties in and about South Bend for 35 years.

Upon the reorganization of the street railway property to the Northern Indiana Railway, Inc., his long years of service and outstanding activity in the building up of street railway service in South Bend brought him the appointment as vice-president of the new company.

Mr. Wair was born in September, 1871. In addition to his activity in the railway, he was one of the most prominent attorneys in South Bend, being counsel for many of the large corporations in Northern Indiana.

James Carey Davis

James Carey Davis, advisory operating vice-president of the American Steel Foundries, Chicago, Ill., died at Mackinac Island on Aug. 10, aged 65 years.

For seventeen years Mr. Davis was associated with the Sargent company. In 1896 he became general superintendent of operations, in which position he remained until 1901 when he accepted a similar position with the Leighton & Howard Steel Company, St. Louis. He remained in this capacity until both companies were absorbed in 1902 by the American Steel Foundries. He then became western district manager and in June, 1905, was transferred to the Chicago office as assistant to the first vice-president in charge of



J. C. Davis

operations. In 1912 he was elected fourth vice-president of the company, in charge of foundry operations, and continued to occupy that position until March 21, 1929, when he was elected advisory operating vice-president.

Scott H. Blewett

Scott H. Blewett, general agent in St. Louis for the American Car & Foundry Company, died on July 24 following a long illness. Mr. Blewett joined the company as a general agent 35 years ago. Prior to that he was principal of two public schools in St. Louis. He was born at Georgetown, Ky., on Nov. 28, 1851, and was graduated from Colby University, Waterville, Me. For four years after leaving college, he was connected with a publishing concern in Cincinnati. He went to St. Louis in 1874. In 1880 he left the public school system there to become general superintendent of the Scruggs-Vandervoort-Barney Dry Goods Company with which he continued until he joined the American Car & Foundry Company in 1894.

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Thomas H. Rowland, one of the organizers of the company which constructed the first street railway line—a steam tramway—to reach from Kansas City, Mo., into the newly platted suburban districts of Kansas City, Kan., died in Santa Ana, Cal., recently.

✦

Dimmitt Elwood South, manager of the office of the Georgetown, Portsmouth & Cincinnati Traction Company at Bethel, Ohio, and former employee of the United States Treasury, is dead.

INDUSTRY MARKET AND TRADE NEWS

Delivery of New York Subway Cars Begins

Ten of an order of 300 new cars for New York's new subway system were delivered in the first week in August to the 207th Street yards, where motors and electrical equipment will be installed. More than 1,000 workmen are engaged in filling the city's $9,000,000 order at the Berwick, Pa., shops of the American Car & Foundry Company, and deliveries will be made from time to time as the units are completed.

Painted an olive green and bearing the name "City of New York" along the side, the new cars embody in their design several original features of construction. Four pairs of double doors on each side, with each opening 3 ft. 10 in. wide, allow entrance and exit in eight lanes, and are expected to facilitate the interchange of passengers at station stops. Quick dispatch will be further expedited by an improved door mechanism, which will prevent the holding of cars by delayed passengers. If the door, in closing, strikes any object, it halts, but does not completely reopen as do the doors on the I.R.T. trains. When the object is removed the door closes. The new cars have no vestibules.

New Cars a Substantial Improvement Over Present Models

Fully equipped, with motors, the new cars cost approximately $38,000 apiece. Each car is a complete unit and none of the trailer variety are being purchased by the city. Cars are 60 ft., 6 in. long, 9 ft. 2 in. longer than the I.R.T. cars and about 7 ft. shorter than the single steel cars used by the B.-M.T. The triplex B.-M.T. cars are 137 ft. long. I.R.T. cars cost approximately $26,000 and triplex B.-M. T. cars in the neighborhood of $75,000.

The new cars will seat 60 passengers and have a total capacity of 280. This compares with a capacity of about 600 in the B.-M.T. triplex units, and is more than the comfortable capacity of the I.R.T. cars. Station platforms on the new city subway have been designed to accommodate trains of eleven cars, longer than either the B.-M.T. or I.R.T. trains.

Maximum speed of the cars is between 45 and 50 m.p.h. Automatic, quick release, electro pneumatic brakes should stop them within 500 ft. when operating at 40 m.p.h.

All cars are equipped with multiple-unit door control, with only three men needed to operate a train—a motorman, a conductor and a rear guard.

New Street Cars Arrive in Detroit

The first of an order of 130 street cars, ordered earlier in the year from the St. Louis Car Company for the City of Detroit Department of Street Railways, was delivered in that city on Aug. 11. The remaining cars are to be shipped at the rate of six each week until the order is completed.

Costing approximately $13,500 each, the new cars are of the single-end, double-truck, front-entrance, center-exit type, arranged for two-man operation and seating 52 passengers. Orders for motor and control equipment were divided equally between the Westinghouse and General Electric companies.



In addition to leather upholstered seats, ample standing capacity is provided in new Detroit cars



General view of new Detroit cars, showing arrangement of entrance and exit doors

Oklahoma Railway Awaits New Cars

Delivery is soon to be made by the St. Louis Car Company of ten one-man, single-end, double-truck passenger cars which were ordered last April by the Oklahoma Railway for service in Oklahoma City. The new cars will be of all-steel construction, with arch roofs, and will weigh approximately 25,000 lb. Length over all will be 37 ft. 5 in.; length over body posts, 27 ft. 2 in., and over-all width 8 ft. 4 in. Motors and air brake equipment are to be supplied by Westinghouse, and trucks are of the St. Louis Car Company Type GR-54.

Other specifications are as follows:

Armature bearings	Plain
Car signal system	Faraday high voltage
Compressors	Westinghouse D.H.-16
Conduit	Flexible
Control	Westinghouse K-35
Curtain fixtures	National Lock Washer Co.
Curtain material	Pantasote
Door mechanism	National Pneumatic
Doors	Folding
Fare boxes	Johnson
Finish	Duco
Hand brakes	St. Louis Car Company-Harmon type
Heaters	Consolidated
Headlights	Golden Glow SM-95
Interior trim	Mahogany
Journal bearings	Plain
Journal boxes	St. Louis 4 7/16 x 4 in.
Lamp fixtures	Westinghouse
Roof material	Wood, canvas covered
Sash fixtures	Adams & Westlake
Seats	St. Louis
Seat spacing	29 in.
Seating material	Rattan
Slack adjusters	St. Louis
Steps	Folding
Step treads	St. Louis
Trolley catchers	Ohio Brass
Trolley base	Westinghouse
Trolley wheels	Westinghouse
Wheels	Steel, 26 in. diameter
Wheelguards	St. Louis

New Cars for Edmonton Property

Edmonton Radial Railway, Edmonton, Alta., has placed an order with the Ottawa Car Manufacturing Company for five double-truck steel motor cars, equipped with safety features, for one-man operation in city service. General dimensions of the new cars are: length over all, 46 ft.; length over body posts, 30 ft.; height, rail to top of roof, 10 ft. 6 in.; width over sheathing, 8 ft. 3 in. Total weight will be approximately 38,675 lb., made up as follows: car body, 19,000 lb.; air brake equipment, 2,200 lb.; electrical equipment, 7,400 lb.; trucks, 10,075 lb. Seating capacity will be 51 passengers.

The roof is to be of plain arch type, with steel carlines. Cars will be equipped with double folding doors at the front, and a treadle-operated exit door near the center. The forward door of the pair at the front will be for entrance, and the other will be for exit purposes. The front doors will be operated by folding door engines. Haskelite will be used for interior finish, such as curtain boards, waist paneling and bulkhead lining.

Electrical equipment will include four GE-247-J, 40-hp. motors. Canadian General Electric Company is to supply air brake equipment and safety car control equipment with selective valve and treadle for center doors. Trucks will be of Canadian Car & Foundry Company's design, with 5-ft. 4-in. wheelbase, and with cast-steel bolsters and patented spring-tension, drop-forged, case-hardened link bolster guides. Axles will be A.E.R.E.A. standard forged steel type, with 4-in. diameter motor bearings. Journal bearings will be of the roller type, and the wheels, of rolled steel, will be 26 in. in diameter.

Other specifications are as follows:

Car signal system	Faraday
Curtain fixtures	National Lock Washer Co.
Curtain material	Pantasote
Destination signs	Keystone
Fare boxes	Cleveland No. 5
Hand brakes	Peacock staffless
Headlights	Ohio Brass Company
Headlining	5/16 in. Agasote
Interior trim	Birch
Painting scheme	Red, cream trim
Roof material	Wood, canvas covered
Seating material	Leather
Step treads	Honeycomb
Trolley catchers	Earll No. 10
Ventilators	Nichols-Lintern
Wheelguards	H-B life guards
Special devices	Nichols-Lintern air sand hoppers

Dodge Brings Out New Models

Two new body designs, each of 21-passenger capacity in a new 172-in. wheelbase chassis, as well as changes in power plants of existing models have been announced for production by Dodge Brothers. The new chassis is of the conventional type, powered with an eight-cylinder 3½x5-in. engine of 384.84-cu.in. displacement, which develops maximum of 120 hp. at a speed of 300 r.p.m.

Body designs are radical in appearance in that the fronts have been designed to produce less wind resistance. At the same time the driver is moved up alongside of the engine so that 20 in. of body seating area has been released for widening out seat centers and to give more comfortable wheelhouse seats.

A single body shell is designed to be used for either parlor car or city service. In the latter service, doors are of the double jacknife type, folding inward, with a rear exit door cut in behind the rear axle on the right-hand side. Both of these doors are operated by vacuum engines under the control of the driver by a four-position lever control valve. The first position opens the front service door, the second position is neutral, while the third position opens the rear exit door. Thus the rear door opens last and must be closed prior to operation of the front service door.

As for weights, the chassis tips the scales at 7,500 lb. The parlor car, ready for service with full complement of gasoline, spare tires, etc., weighs 12,000 lb., while the city service vehicle weighs 500 lb. less, or 11,500 lb. Equivalent weight on a per seat basis for the parlor car is 572 lb. and for the city bus, 547 lb.

Recent Bus Deliveries to Electric Railways

The General Motors Truck Company announces the delivery of 30 Yellow Coaches to electric railways, divided as follows: Twelve double-deck gas-electric coaches to the Baltimore Coach Company; twelve Type Z 38-passenger city service coaches to New Orleans Public Service, New Orleans; ten additional Type Z 29-passenger city service coaches to the Connecticut Company, New Haven; two additional Type Z 29-passenger city service coaches to the Delaware Bus Company, Wilmington, Del.; and two each of the Type U 21-passenger city service coaches were delivered to the Mississippi Valley Electric Company, Iowa City, Ia., and to the Beaver Valley Motor Coach Company, Pittsburgh.

The Eastern Massachusetts Street Railway has accepted within the past month six A.C.F. buses of the 40-passenger all-steel Metropolitan type, and five White Model 65A buses. Other A.C.F. deliveries include thirteen 40-passenger all-steel Metropolitan coaches to the United Electric Railway of Providence, R. I., and two 23-passenger street car coaches to the Triple Cities Traction Company, Binghamton, N. Y.

The White Company reports 21 bus deliveries for the month of July, among which were one White Model 54 and one White Model 54A to the Boston, Worcester & New York Street Railway, Framingham, Mass.; two White Model 65 to the Wisconsin Public Service Corporation, Green Bay, Wis.; one White Model 54A to the Brooklyn Bus Corporation, Brooklyn, N. Y.; three White Model 65A to the Evansville Suburban & Newburgh Railway, Evansville, Ind.; and eight White Model 65 to the Aronomink Transportation Company, Upper Darby, Pa.

Twin Coach Corporation also reports for the month of July one trolley bus to the Brooklyn & Queens Transit System, Brooklyn, N. Y.; three urban buses to the Milwaukee Electric Railway & Light Company; eight urban buses to the Aronomink Transportation Company, Upper Darby, Pa.; and two urbans to the United Electric Railways, Providence.

Deliveries by the Mack International Motor Truck Corporation of recent date consist of one Model BC, 29-passenger city-type bus to the Holyoke Street Railway, Holyoke, Mass.; one Model BC and one Model AB city-type bus to the Fonda, Johnstown & Gloversville Railroad, Gloversville, N. Y.



Reduced wind resistance and increased comfort of wheelhouse seats feature radical body designs incorporated in new bus models

Electric Railway Material Prices—September, 1930

Metals—New York

Copper, electrolytic, delivered, cents per lb.	10.75
Lead, cents per lb.	5.00
Nickel, cents per lb., ingot	35.00
Zinc, cents per lb.	4.35
Tin, Straits, cents per lb.	30.00
Aluminum, 98 to 99 per cent, cents per lb.	23.30
Babbitt metal, warehouse, cents per lb.:	
Commercial grade	37.00
General service	31.00

Bituminous Coal

Smokeless mine run, f.o.b. vessel, Hampton Roads, gross tons	$4.15
Somerset mine run, f.o.b. mines, net ton	1.75
Pittsburgh mine run, Pittsburgh, net ton	1.40
Franklin, Ill., screenings, f.o.b. mines	1.50
Central, Ill., screenings, f.o.b. mines	1.15
Kansas screenings, Kansas City	1.75

Track Materials—Pittsburgh

Standard steel rails, gross ton	$43.00
Railroad spikes, drive ⅝ in. and larger, cents per lb.	2.80
Tie plates (flat type), cents per lb.	2.075
Angles bars, cents per lb.	2.75
Rail bolts and nuts, cents per lb.	3.90
Steel bars, cents per lb.	1.70
Ties, white oak, Chicago, 6 in. x 8 in. x 8 ft.	$1.40

Hardware—Pittsburgh

Wire nails, base per keg	$2.10
Sheet iron (24 gage), cents per lb.	2.45
Sheet iron, galvanized (24 gage), cents per lb.	3.05
Galvanized barbed wire, cents per lb.	2.80
Galvanized wire, ordinary, cents per lb.	2.80

Waste—New York

Waste, wool, cents per lb.	12.00 to 15.00
Waste, cotton (100 lb. bale), cents per lb.:	
White	9.00 to 13.00
Colored	5.00 to 7.00

Paints, Putty and Glass—New York

Linseed oil (5 bbl. lots), cents per lb.	13.3
White lead in oil (100 lb. keg), cents per lb.	13.75
Turpentine (bbl. lots), per gal.	0.48
Putty, 100 lb. tins, cents per lb.	5.725

Wire—New York

Copper wire, cents per lb.	12.75
Rubber-covered wire, No. 14, per 1,000 ft.	$5.05
Weatherproof wire base, cents per lb.	4.89

Paving Materials

Paving stone, granite, 5 in., f.o.b.: New York—Grade 1, per thousand	$150.00
Wood block paving 3½, 16 lb. treatment, N. Y., per sq.yd., f.o.b.	2.50
Paving brick 3½x8½x4, N. Y., per 1,000 in carload lots, f.o.b.	50.00
Paving brick 3x8½x4, N. Y., per 1,000 in carload lots, f.o.b.	45.00
Crushed stone, ¾-in., carload lots, N. Y., per cu.yd., delivered	3.40
Cement, Chicago, in carload lots, without bags, f.o.b.	1.95
Gravel, ¾-in., cu.yd., delivered New York	3.40
Sand, cu.yd., delivered New York	2.15

Old Metals—New York and Chicago

Heavy copper, cents per lb.	8.75
Light copper, cents per lb.	7.75
Heavy yellow brass, cents per lb.	5.75
Zinc, old scrap, cents per lb.	2.25
Lead, cents per lb. (heavy)	4.25
Steel car axles, Chicago, net ton	$15.25
Cast iron car wheels, Chicago, gross ton	13.75
Rails (short), Chicago, gross ton	14.00
Rails (relaying), Chicago, gross ton (65 lb. and heavier)	28.50
Machine turnings, Chicago, gross ton	6.25

American Turnstiles for Argentine Subway

Perey Manufacturing Company has received an order for more than one hundred Perey Coinpassers and a number of Perey Standard Passimeters for installation in the stations of the new Lacroze subway in Buenos Aires, Argentina. The system of collection will be similar to that used on the B.-M.T. subways in New York. The fare to be charged is ten centavos and the coinpassers are being made to receive a coin of this denomination. The instruments are to be provided with bulls-eye illuminated coin detectors to prevent the deposit of slugs and counterfeit coins.

Brill Company Reports Orders

The J. G. Brill Company announces that it has recently received orders for three double-end, double-truck cars, to be equipped with Brill 84-E trucks, from York Railways, York, Pa. Eighteen double-end, double-truck cars, to be provided with Brill 177-E type trucks, have been ordered by Empresas Electricas Associadas, of Lima, Peru. The Brill Company will also supply eight 40-passenger trolley buses for the Chicago Surface Lines.

Equipment Ordered for Reading Railroad's Substations

Another step in the $20,000,000 electrification program of Reading is reflected in an order to the Westinghouse company for supervisory control and switchboard equipment for seven power substations and fourteen intermediate stations to supply current to the electrified zone. There will be a total of 24 controlled stations in the present electrification project.

Power will be received from the 60-cycle commercial lines of Philadelphia Electric Company, at the Wayne Junction converter station, and distributed at 25 cycles to substations as required for operation of trains. The electrical energy will be under immediate supervision of chief power dispatcher at Wayne Junction, and any rearrangement of the power feed, necessitated by failure or repair to lines, may be made without interruption of service.

Ohmer Directors Meet

At the meeting of the board of directors of the Ohmer Fare Register Company, Robert C. Lee of the Guardian Trust Company, Cleveland, was elected a director to fill a vacancy on the board. Other directors are John F. Ohmer, H. B. Ohmer, John P. Breen, John S. McIntire and H. W. Baker, of Dayton; Freeman C. Allen of Rochester, N. Y.; F. J. Lisman of New York City and John F. Ohmer of Los Angeles.

During the meeting at the company's offices, several new machines that will shortly be announced to the public, were inspected and plans approved for their distribution.

Copper Lowest in Twenty Years

With sales of copper in considerable quantity at 10.75 cents during the past few weeks, this commodity has attained its lowest price in the current market, as well as the lowest level in more than twenty years. The decline started shortly after the first of the year, when the price was cut 4 cents a pound from the 18-cent level, where it had been pegged for several months. In spite of efforts on the part of producers to maintain the price at a higher level, there has been a steady decline to the present low figure. Heavy stocks of the metal on hand and a decreased demand on the part of certain interests, which have been large consumers, have contributed to lower the price. A sharp curtailment of output is now forecast, with a probable gradual upswing in the quotation.

Production to Start by General Car & Coach Company

O. F. Warhus, president of the General Car & Coach Corporation, has announced that production of the company's standardized street car and trolley bus will start on a schedule of 100 cars a year at the factory established in Rensselaer, a suburb of Albany, the plant representing an investment of $175,000. It is intended to start manufacture within a few weeks, and within three months it is expected that 150 men will be at work. This number will be increased to 200 when production begins to hit the stride now planned.

The type of car proposed for manufacture will be similar to Car No. 301 of the United Traction Company, Albany, to be built under patents held by Mr. Warhus. The vehicle will weigh 12 tons.

The site acquired by the new company for its plant was formerly owned by the Eastern New York Utility Company. It includes a carhouse, freight shed, power plant, machine shop, garage and offices and contains approximately 45,000 sq.ft. of floor space. The property covers 5 acres in the heart of lower Rensselaer.

Mr. Warhus is a native of Davenport, Iowa. He has had twenty years of experience in the field of electric transportation. He was vice-president and general manager of the Versare Corporation and later vice-president and director of the Cincinnati Car Company, where he was in charge of engineering and sales.

T. M. van der Stempel, formerly of the staff of ELECTRIC RAILWAY JOURNAL, and a graduate mechanical-electrical engineer, will be in charge of sales. He has had experience both here and abroad in electric railway and highway transportation engineering problems.

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Firestone Tire & Rubber Company, Akron, Ohio, has prepared figures showing the sharp decline in tire-mile costs over a period of years, indicating the engineering and manufacturing progress made in this field. According to the company's reckoning the average tire-mile cost of its product for 1930 is approximately one-fifteenth of the cost in 1910.

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White Motor Company, through its directors, at a meeting held on Aug. 1, reported net earnings for the first six months of the current year of $1,048,000, as compared with earnings of $1,404,000 for the same period last year. Sales during the period exceeded $21,000,000, which is approximately 90 per cent of the peak period of last year. The showing is regarded as particularly gratifying in view of general business conditions. Through a readjustment of working schedules and rearrangement of hours, the company has maintained its full working force in the production department of the business, and there have been no reductions in the wage rates of any of the workers.

A high return on your investment, through

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Canadian Representative: Lyman Tube & Supply Co., Ltd., Montreal, Can.



All coaches of Pacific Northwest Public Service Company, Portland, Oregon, formerly Portland Electric Power Co., are on Goodyears.

"Tire costs per mile greatly reduced"



Why do "more people ride on Goodyear Tires than on any other kind"? Letters like this speak for themselves:

"Have 49 buses which have been using Goodyear Tires exclusively for the last two years. Tire costs per mile during that period are greatly below the costs prior thereto, and our operating delays due to tire failures have been greatly reduced."

THE GREATEST NAME IN RUBBER

GOODYEAR

ON YOUR NEW MOTOR COACHES SPECIFY GOODYEARS



The firm that is constantly working to improve its own interests, is doing much to speed the wheels of industry and keep the wheels of traffic rolling.

Advertising in building any business, indirectly benefits others—transportation especially.

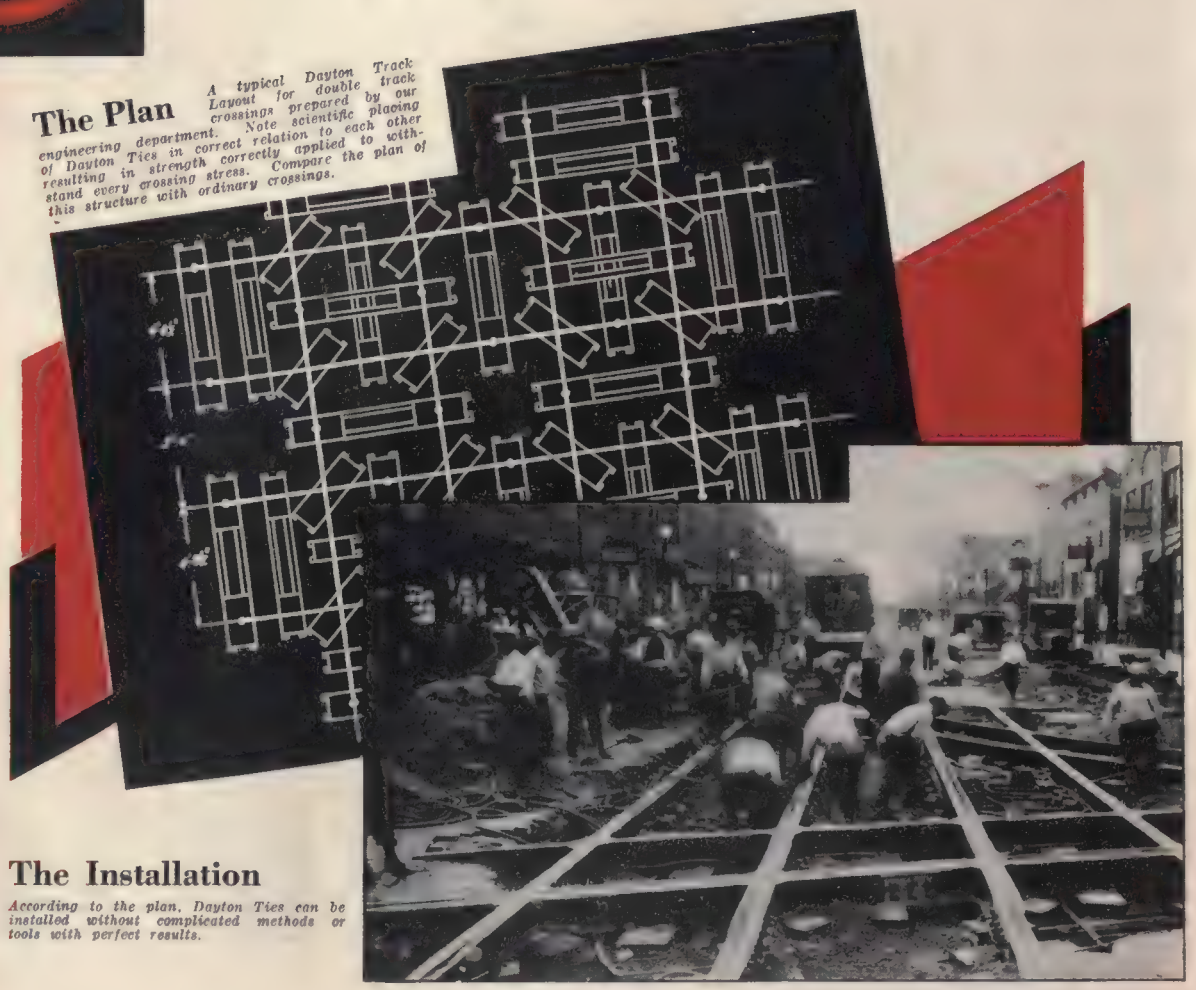
Collier Service, in developing business with advertisers, does much to help maintain a steady flow of traffic on the electric railway lines.

Barron G. Collier Inc.

CANDLER BLDG. NEW YORK CITY

Car Card Advertising Almost Everywhere

8 YEARS *is too* adequately tell



The Plan

A typical Dayton Track Layout for double track crossings prepared by our engineering department. Note scientific placing of Dayton Ties in correct relation to each other resulting in strength correctly applied to withstand every crossing stress. Compare the plan of this structure with ordinary crossings.

The Installation

According to the plan, Dayton Ties can be installed without complicated methods or tools with perfect results.

Get this clearly!

Dayton Ties—provide perfect support for Special Work—even to Steam Road Crossings —an accomplishment hitherto unheard of.

Is it surprising therefore that Dayton Ties serve so well under the lesser stresses in tangent track?

The Eight Year Result

And to the right is a typical Dayton Tie Crossing after successfully resisting for eight years the heaviest city traffic that could be placed upon it. As smooth and unbroken and maintenance free today as when installed in 1922. And Eight Years is a short time for Dayton Tie Crossings.

THE DAYTON MECHANICAL TIE CO., *Dayton, O.*

THE DAYTON INTEGRAL SYSTEM

short a time - to the story of DAYTON TIE+CROSSINGS

If there is one place in your track that tests to the limit the real merit of a tie, that place is in crossings and special work. No ordinary tie—in fact, not one —has demonstrated its ability to stand the gaff of crossings for any length of time except Dayton Ties, and their record is worth investigating.

If you have been led to accept the idea that your crossings must be short lived, . . . that expense of maintaining them must be continuously high because your experience has been that no tie can stand the incessant pounding of crossing traffic, . . . BANISH THE THOUGHT. Crossing installations with Dayton Ties, both steam road and electric, in every installation made, have been proven to give so many years of maintenance free life that they have yet to show how really long they will give service.

Dayton Ties win the endurance record for crossings because they have in them the essentials for long life . . . a tie that provides perfect reinforcement with concrete and at the same time protects the concrete from vibratory shock. Put Dayton Ties to any test of endurance—try them under every traffic condition—(straight track or crossings)—and you will get a new conception of a track that is built to endure, yet whose initial installation cost, and cost per mile per year is less than the cheapest track on your streets.



OF TRACK STRUCTURE

62 Million Miles

100% FIRESTONE

EQUIPPED AND SERVICED



ECONOMY—represented by reduced overhead, more mileage and fewer road failures—is the reason Buckeye Stages are equipped 100% with Firestone Gum-Dipped Balloons. They have demonstrated superior performance through sixty-two million miles of tested service for Buckeye Stages alone!

Let us explain in interesting detail how the supreme combination of Firestone Gum-Dipped Tires and Firestone Service can effect the same satisfactory savings for you. In billions of miles of tested service by leading bus lines from coast to coast, Firestone Truck and Bus Balloons have written a record of performance absolutely unequalled in the annals of the tire industry.

P. R. Guthrie, Vice-President and General Manager, Buckeye Stages, Inc., states that "since January 1, 1930, we have averaged less than six tires per month in road-delays which give us an average mileage of 48,254 miles without delay.

"This is an increase of approximately 6,000 miles without delay over the very satisfactory record which we established last year."



Firestone

TIRES — TUBES — BATTERIES — BRAKE LINING

Copyright, 1930, The Firestone Tire & Rubber Co.

"Hurry!... let's catch the *brightly lighted bus...*"



The cheery coach lighted by an Exide Battery attracts patrons



PEOPLE hurrying from work and shopping these autumn nights want a comfortable ride home. Leaning back and reading with ease . . . forgetting tired feet . . . make a ride seem shorter, the service more friendly, and turn occasional fares into steady patrons.

And a comfortable ride means more than easy seats and good springs. It means powerful running lights that insure safety . . . and bright, well-placed interior lamps that give an atmosphere of warmth and cheer.

Proper equipment is vital to insure adequate lighting. A generator of the right capacity, backed by a dependable storage battery, is necessary. Hundreds of motor coach operators throughout the country have standardized on Exide Motor Coach Batteries for absolutely dependable, economical operation over an unusually long time.

Specially designed Exide Bus Batteries are the product of a company with forty-two years' experience in building batteries for every purpose.

Exide
MOTOR COACH
BATTERIES

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia
THE WORLD'S LARGEST MANUFACTURERS OF STORAGE BATTERIES FOR EVERY PURPOSE
Exide Batteries of Canada, Limited, Toronto

a new name for an old product

VARTEX

TRADE MARK

THE PEAK OF QUALITY



1927
1928
1929
1930



For 23 years

the leading manufacturers of motors, transformers, cables and other electrical apparatus have purchased superior varnished cambric tapes and cloth from this Company.

Now, we announce a new name:

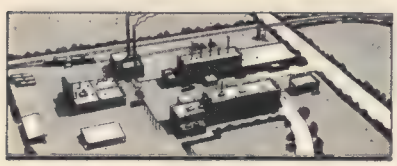
VARTEX

for these **VAR**nished **TEX**tiles

Attention is drawn particularly to

VARTEX SEAMLESS BIAS TAPES

which cost the same as sewed seam tapes and have none of their disadvantages. VARTEX seamless bias tapes eliminate the excessive thickness which is always troublesome in seamed tapes. They are uniform throughout, are stronger, wrap more evenly than seamed tapes and cost no more.



Our factory facilities are among the largest and most modern in America.

We invite inquiries for large and small orders of

VARTEX VARNISHED CAMBRIC TAPES AND FABRICS

VARTEX THE PEAK OF QUALITY

LOOK FOR THIS LABEL

NEW JERSEY WOOD FINISHING CO., Inc.

FOUNDED 1907

ELECTRICAL INSULATION DEPARTMENT

Woodbridge **New Jersey**

VARTEX THE PEAK OF QUALITY

LOOK FOR THIS LABEL

CONSOLIDATED'S New Heating Unit is different



THROUGH the use of magnesium oxide, a high insulating efficiency has been achieved in this new unit. This material has the highest melting point of any substance used for insulation.

It is compacted around the heating elements under hydraulic pressure, a feature which adds to its efficiency as a conductor of heat, and assures the safety of the heating element under high over loads.

Elements and insulation are sheathed moisture-proof in a seamless tubing container.

Welding and crimping have been eliminated in this new construction.

YOUR PROBLEMS...

IN—Car-Heating . . . Door-Operation . . . Car-Signalling
. . . Safety Control of Auxiliary Car-Circuits

...OUR SPECIALTY

CONSOLIDATED CAR-HEATING CO., INC.

NEW YORK ALBANY CHICAGO

You, too, can cut chassis lu
Koolmotor Universal Greas



It is not unusual for new users of Koolmotor Universal Grease and the Cities Service Grease Gun to find their chassis lubricating costs cut in half. In addition, chassis maintenance costs show an appreciable decrease.

Koolmotor Universal Grease is rich, sturdy, full-bodied—stands up under withering heat—lasts longer—gives positive protection against unnecessary repairs and breakdowns.

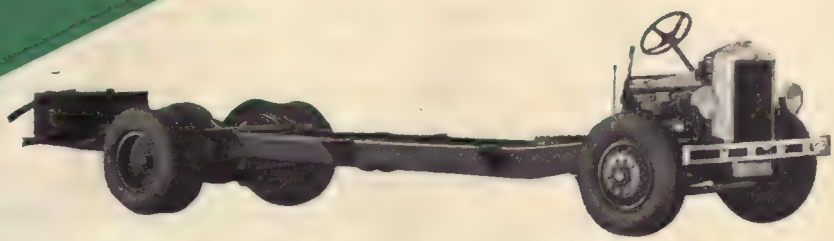
The Cities Service Grease Gun applies this high quality grease rapidly—saves time and labor—assures correct volume to every lubrication point.

CITIES SERVICE COMPANY

60 Wall Street New York City

KOOLMOTOR PRODUCTS

...ricating costs in half with ...and the Cities Service Grease Gun





This Cities Service Grease Gun has been in use for three years. It has proved itself in actual service. More than 300 are now in daily use. It is an automatic, one-man gun utilizing shop air pressure from 50 to 300 lbs. It holds 85 lbs. of grease and weighs 185 lbs. empty. It delivers large volume—2 lbs. of free grease per minute. On 150 lbs. of air it delivers at 6000 lbs. pressure. It handles the heaviest and tackiest types of grease and it is simple and rugged—capable of continuous use.

With this gun one man now greases three times the number of buses he could do formerly, with the best equipment available.

Koolmotor Universal Grease was developed to meet present-day requirements—for chassis, universal joints, steering columns, wheel hubs, packed ball and roller bearings — wherever a grease should be used.

Koolmotor Universal Grease is made from 100% pure Pennsylvania cylinder oil. It is tenacious without being sticky. It does not oxidize; won't harden when exposed.

Koolmotor Universal Grease has a high melting point—350° F.—almost twice the melting point of ordinary cup grease. Koolmotor Universal Grease comes in *Medium, Heavy, Extra Heavy,* and *Special Heavy*—a correct grade for every condition.

Let us show you how to cut your chassis lubricating costs in half—or more. Send for complete details of Koolmotor Universal Grease and the Cities Service Grease Gun today.

What Should a Pole LOOK LIKE? . . .



NOT so many years ago, poles were solely an engineering problem. No one gave much thought to their appearance. The poles were there for a specific purpose—and they served that purpose.

But Union Metal engineers had definite ideas as to how a modern pole should look. They put these ideas to work. And so, after years of research and designing, the Fluted Steel Pole was developed.

Here was a pole made for the modern city, gauged to the tempo of 200-foot boulevards, airports and sky-scrapers. A pole that did its work surely but unobtrusively.

So well is this pole designed that it blends into the background of city streets — becomes a part of the city plan.

As for strength, Union Metal Heavy Duty Poles often replace two old style poles. They support trolley-span wires, street lighting units, distribution lines and other electrical equipment. One type of pole carries all services.

Many of the largest utilities in the country have installed these distinctive poles for they realize that by so doing they are contributing to the City Beautiful movement. Detroit, Cleveland, Pittsburgh, New Orleans, Los Angeles and Topeka are typical of the larger cities which are benefiting from this modern equipment. Each installation means a better looking street, an uncluttered curb. To the utilities it means economical pole lines, uninterrupted service and the building of permanent good will.

THE UNION METAL MANUFACTURING COMPANY
GENERAL OFFICES AND FACTORY ◆ CANTON, OHIO
SALES OFFICES: New York · Chicago · Cleveland · Boston · Los Angeles
San Francisco · Seattle · Dallas · Atlanta
DISTRIBUTORS
General Electric Merchandise Distributors Graybar Electric Company, Inc.

UNION METAL DISTRIBUTION POLES

NEW



MOTOR COACHES BY

DODGE BROTHERS



MODEL 90 STREET CAR COACH

New! Advanced!

Unique . . . practical . . . a radical and original departure from conventional motor coach design. Perfected after intensive and extensive research, engineering and testing, these new Dodge Brothers Motor Coaches meet, in full measure, the needs of operators. » » » Uniquely designed with a comparatively short wheelbase and a large load capacity, these new and original coaches are surprisingly easy to maneuver. » » » The Street Car seats 21 passengers and has ample aisle space for approximately 30 standees.



FRONT VIEW. The originality of these new coaches is nowhere more apparent than at the front. This unique construction reduces wind resistance to a marked extent—as proved by wind-tunnel tests. Such a feature reflects itself in power-conservation and therefore lower operating costs. Note, too, the wide windshield with side vents and two double-blade wipers, also the two cowl ventilators, clearly readable destination sign, double-horn and side lights near roof. Front end of body is of the vertical buttress type, of structural steel angles which are riveted, welded and gusseted to insure absolute rigidity.

INTERIOR OF STREET CAR. Exceptional headroom, leg-room and vision provided. Aisle space is unusually large. Entrance and exit doors operated by door-engines, controlled by driver. Windows have non-rattling, satin-finished brass sash with transom, and may be easily raised to provide a 16" opening. Seats upholstered in high-grade, genuine leather. Ample illumination provided by 10 dome lights. Floor is covered with linoleum.





INTERIOR OF PARLOR CAR. Seats, of the reclining type, have a three-position adjustment and arm rests on aisle and window sides. They are upholstered with rubber-backed mohair—waterproof, long-lived and readily cleanable. Interior baggage lofts are commodious and unusually sturdy. A distinctive modernistic motif has been achieved in the design of such details as reading lights, mirrors, window pillars, baggage lofts, etc.

REAR OF PARLOR CAR. Additional space for bulky baggage is provided on roof.

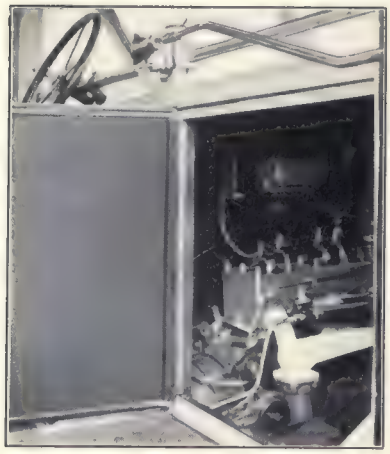


Original!

Entrance at front and exit at rear permit of rapid passenger circulation. Thus, during the long off-peak periods the operating economy of the 21-passenger coach is assured while during the peak hours the capacity of a larger coach is available. The Parlor Car likewise seats 21 passengers and provides the all-around comfort and feeling of safety that riders welcome. Note here and in the following pages a few of the many features of these exceptional coaches—features that insure increased patronage and lower cost per mile.

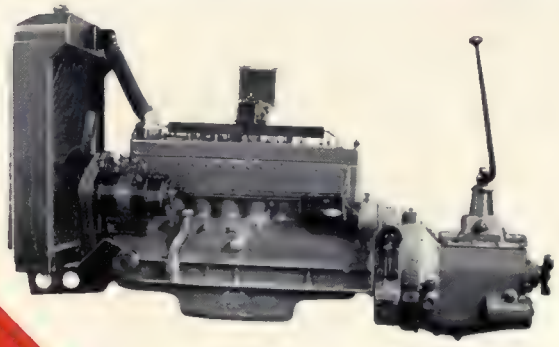


MODEL 91 PARLOR CAR COACH





New and different radiator to





POWERFUL, 8-cylinder engine develops 120-horsepower. Rugged, heavy-duty transmission has four forward speeds. Radiator provides exceptionally large cooling area. The entire power plant—including engine, radiator, clutch and transmission—is quickly removable as a unit from front end of chassis.

Engine is easily accessible through door at front of body interior. The convenience of this practical arrangement—which establishes a new and noteworthy practice in motor coach design—will be readily appreciated by experienced operators.

The unusually rugged 10" frame is of the double-drop type. Outriggers are lined up with cross-members to provide a firm base for body.

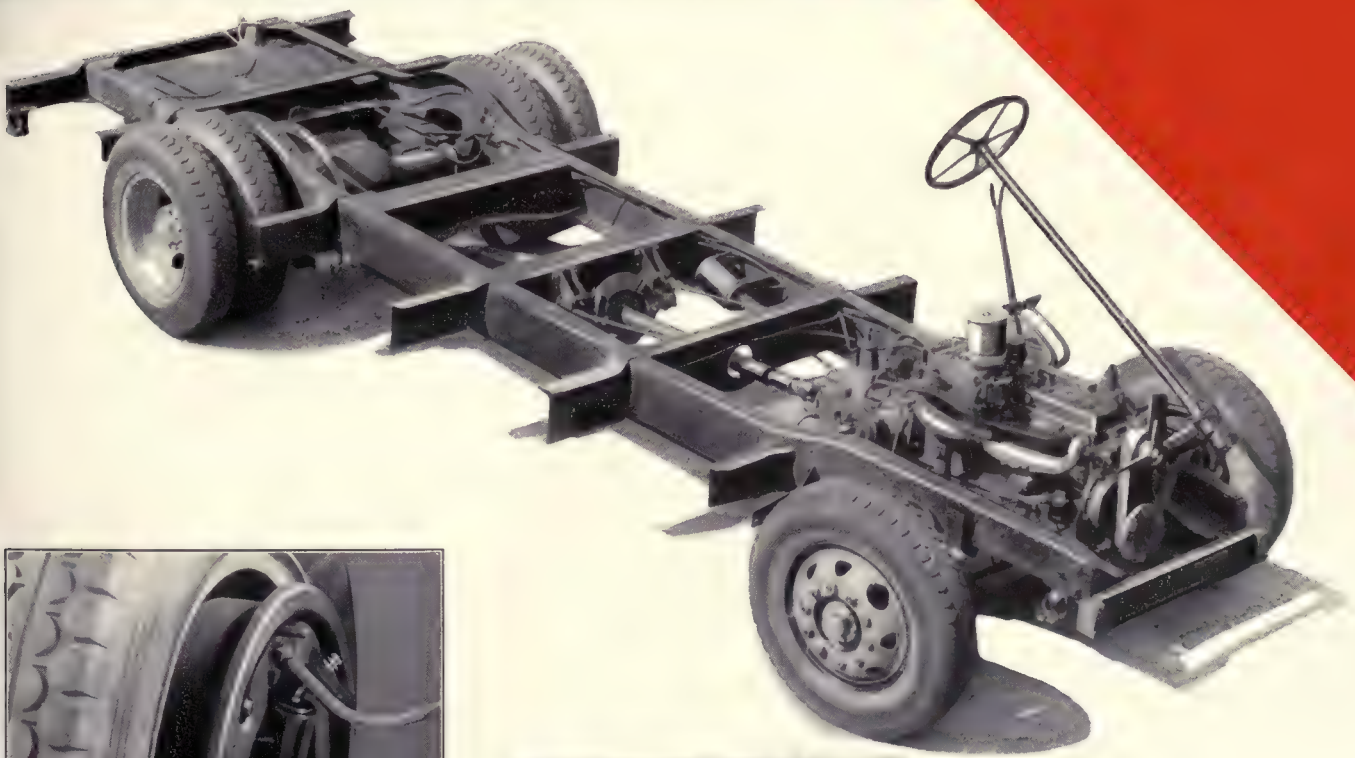


from tail light

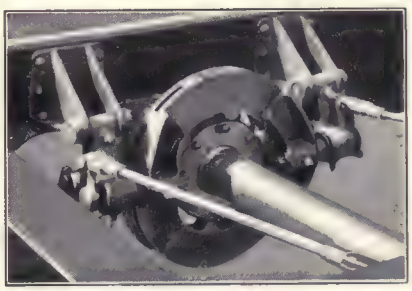
REAR axle is of the full-floating, worm-drive type, with electric furnace cast steel housing. Shafts are free to perform the sole task of driving wheels—weight of coach and load is carried on housing. Two double tapered roller bearings are at outer ends of housings.

Steering gear is the full-contact, worm and sector type, with roller bearing on shaft. Unique construction and mounting minimize reaction in wheels, insure an unusually short turning radius and contribute to increased driving ease.

Service brakes are 4-wheel internal hydraulic—self-equalizing and weatherproof. Booster provides the additional braking effort so necessary for present-day coach operation. The ease with which brakes can be applied is worthy of special note. Driveshaft hand brake of the ventilated disc type is self-aligning in all directions.







ENGINE
Type—L Head
Number of cylinders—8
Bore—3½″
Stroke—5″
Piston Displacement—384.84 cu. in.
Max. Brake H.P.—120 at 3000 R.P.M.
Torque—262 ft. lbs. at 1200 R.P.M.
Suspension—four point
Mounting—rubber insulated

CYLINDERS AND CRANKCASE
Cast—integral
Cylinders—en bloc
Finish of bore—reamed and honed
Cylinder head—detachable
Oil passages—drilled in block

PISTONS
Type—ventilated bridge, split skirt
Material—aluminum alloy, special steel strut
Rings—4 compression, 1 oil

CRANKSHAFT
Material—drop forged special steel

CRANKSHAFT (cont'd.)
Length—41 25/32″
Balanced—statically and dynamically
Weight—104 pounds
Number of main bearings—9
Type of bearings—bronze-backed, babbitt lined
Total length—13″
Total bearing area—112.31 sq. in.

FLYWHEEL
Balanced—statically and dynamically
Starting gear—steel ring shrunk on

CAMSHAFT
Type—cams and gears integral
Material—drop forged, special steel
Number of bearings—6

VALVES
Type—poppet
Location—right side of cylinder block
Material—intake, nickel chromium steel; exhaust, C.N.S. steel
Guides—removable

VALVE TAPPETS
Type—mushroom
Stem—cold-drawn carbon steel
Head—chilled cast iron welded to stem

CARBURETOR
Type—down-draft, dual accelerating pump
Air cleaner with oil wetted wire mesh

FUEL PUMP
Type—variable stroke diaphram
Location—right front of crankcase
Drive—rocker arm off camshaft
Filter and sediment trap

DISTRIBUTOR
Heavy-duty motor coach type
Location—top of cylinder head
Drive—vertical shaft gear driven off camshaft
Advance—full automatic

GENERATOR
Heavy-duty motor coach type
Location—left side of engine at front
Type—voltage regulator
Drive—2 vee belts driven from crankshaft

Mechanically . . .
modern and

GENERATOR (cont'd.)
Mounting—hinge for adjustment of driving belt
Capacity—400-500 watts
Voltage—12
Charging rate—hot, 25 amps.; cold, 35 amps.

STARTER
Heavy-duty
Type—Bendix
Location—left side of motor on flywheel
Normal speed of turning engine—100 R.P.M.

CLUTCH
Location—unit with power plant
Type—dry, single plate
Plate diameter—13″
Release mechanism—graphite composition
Pilot bearing—ball bearing

SERVICE BRAKES
Location—four wheels
Type—weatherproof, internal hydraulic
Controlled—foot pedals with booster
Drums—gun iron
Drum diameter—front, 16″; rear, 17¼″
Lining—Brakeblok

BY
DODGE
BROTHERS

NEW MOTOR COACHES

practical

SERVICE BRAKES (cont'd.)
Width of lining—front, 3″; rear, 4″
Total braking area—416.12 sq. in.

EMERGENCY BRAKE
Location—rear of propeller shaft center bearing
Type—disc type, double shoe
Disc diameter—14″
Total braking area—88.8 sq. in.

SPRINGS
Type—semi-elliptic, underslung rear
Material—silico-manganese high forging spring steel
Number of leaves—front, 13; rear, 13 main (7 in auxiliary on street car)
Width—front, 3″; rear, 3½″; auxiliary, 3″
Length—front, 44″; rear, 60″; auxiliary, 20″
Shackles—shackles and bushings

TRANSMISSION
Type—selective sliding gear—heavy-duty
Location—unit with power plant
Number of speeds forward—4
Number of speeds reverse—1
Main shaft bearing—ball
Countershaft bearing—roller
Main shaft pilot bearing—roller
Idler shaft—bronze bushing
Gear ratios:
Fourth—1.00
Third—1.91
Second—3.89
First—6.86
Reverse—8.00

ENGINE LUBRICATION
Type—forced feed
Oil pump—gear type
Drive—camshaft
Pressure to main, connecting rods, camshaft bearings and front-end drive
Positive spray to pistons, cylinder walls, cams, valve stems and tappets
Oil pan capacity—9 quarts
Crankcase ventilator, oil filter, oil cooler

ENGINE COOLING
Type—centrifugal pump
Pump drive—two vee endless belts
Thermostat
Radiator type—tube and fin
Fan—4 blades

ENGINE COOLING (cont'd.)
Diameter—19″
Drive—extension of water pump shaft
Heat indicator—on instrument panel
Capacity of entire system—10½ gallons
Shutters—manual operated

STEERING
Type—worm and sector
Ratio—varying, 20:1
Steering wheel—malleable spider, tubular steel rim, 20″ diameter

FUEL TANK
Location—under rear of frame
Capacity—50 gallons
Gauge—on dash

BUMPERS
Front—spring type, heavy-duty
Rear—spring type, heavy-duty (Parlor Car)

TURNING RADIUS
Right, 27 ft.; left, 27 ft.

WHEELBASE
172″

WHEEL TREAD
Front, 72″; mean dual rear, 72″

WHEELS
Type—Ventilated disc, dual rear, 7″ D.T. rim

TIRES
8.25/20 balloons, duals rear (street car)
7.50/20 balloons, duals rear (parlor car)

FENDERS
Type—crowned sheet metal

CHASSIS LUBRICATION
Magazine oiling system on shackles and steering; Zerk, wheel-bearings and propeller shaft

BATTERY
Heavy-duty motor coach type
Number of cells—6
Number of plates—13
Capacity—S.A.E. rating 160 ampere hours

PROPELLER SHAFT
Type—two-piece tubular
Diameter—3″
Self-aligning center bearing

UNIVERSAL JOINTS
Type—cross and trunnion
Location—transmission, rear of center bearing, rear axle

CONTROL
Brake lever on frame to left of driver
Gear shift lever on transmission case
Horn button on steering wheel
Throttle, lights, choke, heat control, spark control and ignition switch on instrument board
Shock absorbers—4 on Parlor Car

REAR AXLE
Type—full-floating, worm type
Housing material—electric furnace steel casting
Drive gears—underslung worm drive; worm, straddle mounted; worm adjustment, tapered roller bearing
Axle shaft diameter—1 13/16″ at center, 1 31/32″ at splines
Number of bearings in entire axle—9

FRONT AXLE
Type—reverse Elliott, heavy-duty motor coach type, I-beam section
Wheel bearings—double tapered roller

FRAME
Type—pressed steel channels, double-drop
Material—hot rolled steel
Width—48″
Thickness—3/16″
Maximum depth—10″
Maximum flange width—3¼″
Number of cross members—6

NEW MOTOR COACHES

Body Specifications

FRAMEWORK: Framework is of second growth thoroughly seasoned oak throughout. Oak body pillars are mortised, glued and screwed to the roof rail and anchored by malleable brackets on each side. Brackets also rigidly join the roof carlines to the pillars. Pillars are anchored with bracket to main body sill. All wooden parts are thoroughly treated with lead and oil; non-rusting screws are used throughout.

FRONT END: Front-end construction is of the vertical buttress type having corner pillars of structural steel angles with structural steel framework supporting the windshield. Entire structure is riveted, welded, and reinforced with gussets for maximum rigidity.

SKIRTING: Skirting is reinforced with heavy steel brackets bolted to main sill and pillars and to the angle iron extending entire length of body which rests on the chassis outriggers.

SKID RAIL: Sides and rear of body are protected with heavy oak skid rail, designed in such a manner that shocks from impact are transmitted direct to the chassis frame and are not absorbed by the body.

SIDE PANELS: ¼" Plymetl installed in sections and screwed in place. The upper panels overlap the Plymetl to prevent moisture from entering framework.

ROOF: Haskelite, covered with cotton padding and thoroughly waterproofed duck.

FLOORING: 1⅛" yellow pine, tongue and groove, laid crosswise and covered with $\frac{3}{16}$" battleship linoleum in one piece.

WINDSHIELD: 2 Panel "V" type, sloping windshield, permanently installed in Bonderized steel sash which rests in structural steel framework. Two double blade wipers with motors and mechanism completely concealed. Adjustable side quarter, ventilating windows of swinging type.

WINDOWS: Street Car—Raised type with satin nickel finished brass sash and equipped with anti-rattlers; fixed upper transoms. Glazed with double strength glass. Window lift is 16". Window at left of driver in two sections with sliding sash for signalling purposes. Rear windows are stationary and fitted with wire reinforced glass. Parlor Car—Raised type with satin nickel finished brass sash and equipped with anti-rattlers. Glazed with double strength glass. Window lift is 11½". Side windows are fitted with shades, with rollers operating in wooden grooves. Rear quarters are fitted with curved glass and rear windows are stationary.

ENTRANCE DOOR: Street Car—Double, two leaf folding type at right front, vacuum operated; controlled from driver's seat. Parlor Car—One-piece type operated by adjustable mechanism from driver's seat.

STEPS: All metal with non-skid safety tread.

EMERGENCY DOOR: Parlor Car—On left side at rear, secured by positive lock with signal device.

EXIT DOOR: Street Car—Double, two leaf folding type at rear, vacuum operated; controlled from driver's seat.

SEATS: Street Car—Left side—Three 2-passenger seats 34" wide with individual backs; one 3-passenger longitudinal seat over wheelpocket. Right side—One 2-passenger longitudinal seat at right front; two 2-passenger seats with individual backs; one 2-passenger longitudinal seat over wheel pocket. Rear—Four-passenger seat across rear. Seat cushions and backs are of deep spring construction. Upholstery, including binding and welt, is genuine leather. The rear of the seat backs only are upholstered in imitation leather to match. Grab handles on aisle side of cross seats. Cross seats are staggered providing greater aisle space. Driver's seat is adjustable. Parlor Car—Four double seats of the 3-position reclining type operated by finger control, are located on each side. A section of 5 individual seats extends across the rear. Seats are constructed of steel tube framework covered with wicker woven from fiber and entire seat is upholstered in rubber backed flat mohair which can be easily cleaned with soap and water. Driver's seat is adjustable and upholstered in genuine leather.

SIGNAL SYSTEM: Bell Cord.

HEATING SYSTEM: Kysor exhaust type. Heated air enters body through three ducts effectively located.

VENTILATORS: Street Car—Three coach type ventilators in roof and two in cowl. Parlor Car—Four coach-type ventilators in roof and two in cowl. In both Street Car and Parlor Car one cowl ventilator ventilates the body while the other ventilates engine room.

LIGHTING: Street Car—Interior: ten 15-candle power dome lights on two circuits. Step light at entrance and exit doors. Exterior—Two marker lights, front and rear, with 4" lenses. Parlor Car—Interior lighting is designed in modernistic style having aluminum fixtures at each post above windows with mirrors located between lights. There are five 15-candle power lights on each side on separated circuits. Exterior—Two marker lights, front and rear with 4" lenses. On both Street Car and Parlor Car two stop lights at rear and two adjustable headlamps with depressed beam operated by foot switch.

ADVERTISING RACK: Street Car—On each side and across rear above windows. Accommodate standard cards.

OUTSIDE TRUNK RACK: Parlor Car—Trunk rack with tarpaulins on rear of roof with ladder at rear. Roof retains streamline effect from front to rear.

INSIDE LUGGAGE LOFTS: Parlor Car—Plymetl luggage lofts with solid bottoms and lined with carpet are located on each side and illuminated.

DESTINATION SIGN: Hunter roller type accommodating 4½" letters. Space on curtain for 15 names.

GRAB RAILS: Street Car—One horizontal rail at right of entrance door; one vertical rail at left of entrance door and one at left of rear exit door. Grab rails on ceiling at each side of aisle. Parlor Car—Horizontal rail at right of entrance door. Aluminum alloy hand rails located on edge of luggage lofts.

GENERAL DIMENSIONS:

Overall length of body	247"
Overall width of body	96"
Inside width	92"
Inside height Minimum	76"
Inside height Maximum	78"

LENGTH:

Overall (Bumper to Bumper)	
Street Car	284"
Parlor Car	302"

BY

DODGE

BROTHERS

DETROIT, MICHIGAN

The "Mortar-Flow" Principle

7200 vibrations per minute are produced by the "Mortar-Flow" Pulsator. When clamped to the track structure, as concrete is being placed, the Pulsator transmits these vibrations to all adjacent concrete.

The concrete flows and settles into perfect contact with all the steel of rails and ties. The flowing action completely fills all voids, forming a bond two to three times as strong as that possible with old fashioned hand methods. The entire track structure is permanently sealed.

As an indication of its wide acceptance, the "Motor-Flow" Principle is being used in—

Buffalo, N. Y.
Washington, D. C.
Atlanta, Ga.
Boston, Mass.
Albany, N. Y.
Allentown, Pa.
Pottsville, Pa.
Worcester, Mass.
Cincinnati, Ohio
Tacoma, Wash.
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Indianapolis, Ind.
Akron, Ohio
Cleveland, Ohio
Norfolk, Va.
Winston-Salem, N. C.
St. Joseph, Mo.
San Diego, Cal.
Sandusky, Ohio
Baltimore, Md.
Kansas City, Mo.
Findlay, Ohio
Beaver Falls, Pa.
Havana, Cuba

Any Paved Track is Improved by the "MORTAR-FLOW PRINCIPLE"—

and All Paved Track Needs Improvement

The recently enlarged difficulties of local electric railway transportation can only be met by improved methods of operation and construction.

In paved track construction, the most important—and most widely accepted development—of the past ten years is the "Mortar-Flow" Principle of vibrating track during the concreting operation.

The method and machine are both available for all types of paved track construction.

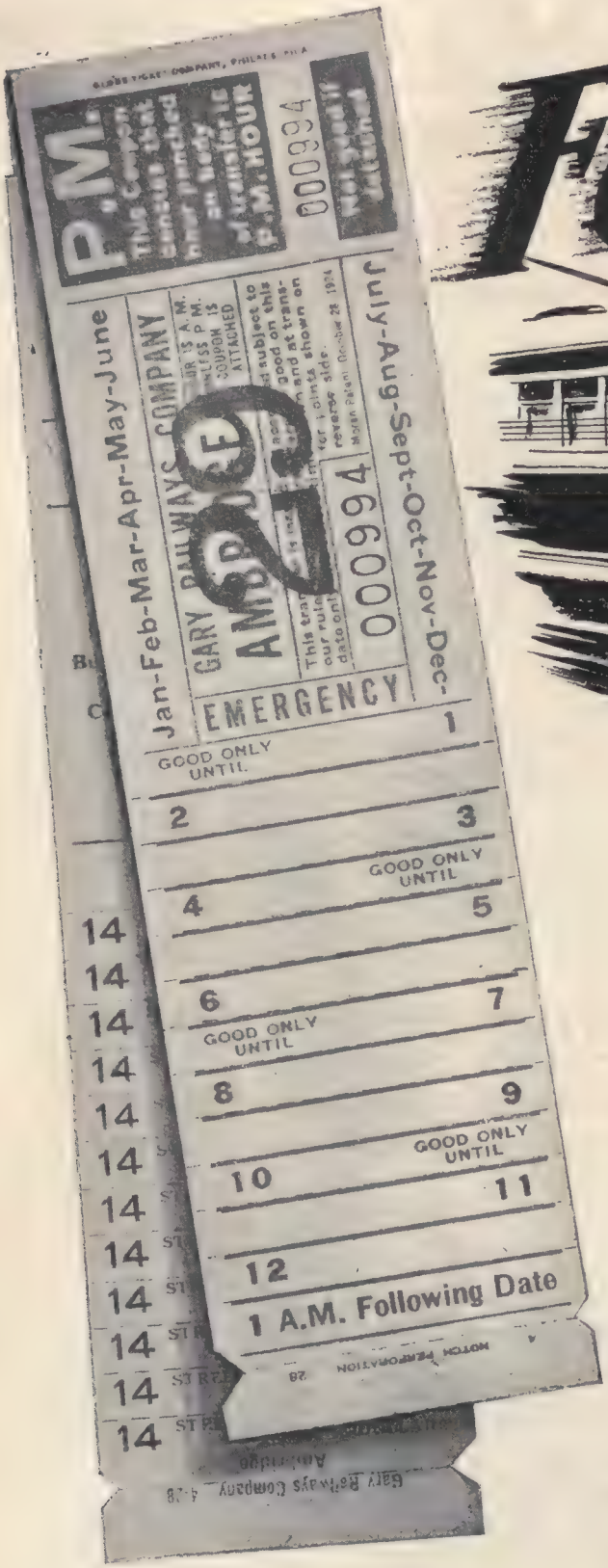
Engineers and executives have, without exception, enthusiastically approved results on all types of paved track.

ADVANTAGES of One "Mortar-Flow" Principle

1. *All voids—even the most minute—are filled.*
2. *Strength of bond between concrete and steel increased two to three times.*
3. *It is the most perfect seal against water entering the structure.*
4. *A denser and more water-proof concrete is produced.*
5. *Vibrating brings excess water to the top of the concrete slab, corrects overwet mixes, increases strength.*
6. *Labor cost for leveling and tamping is reduced.*
7. *Maximum results are obtained with Steel Twin Ties in a concrete base, but the method and machines are available for all types of paved track construction.*

INTERNATIONAL STEEL TIE CO.
CLEVELAND, OHIO





Showing both sides of Moran Patent Transfer. The perforations at each indicated hour make its issuance fast and easy.

Faster



and safer!

This Moran Patent Transfer has three very decided advantages in transferring crowds of passengers at all hours.

First—The P. M. Coupon, if left intact, indicates that the time shown is between noon and midnight. When the conductor tears it off, it automatically indicates morning time.

Second—The transfer, when issued, is torn off at the proper time limit. This shortens the transfer by an amount determined by the time. Any attempt to use the transfer after the limit is instantly noticed, due to the difference in lengh.

Third—The transfer is perforated at each hour. This means that the conductor requires no tear off instrument.

Many prominent operators use this transfer to great advantage. It eliminates fraud to a great extent. It is faster and easier to handle. Write us for samples.

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TICKET COMPANY

Main Office and Factory
112 North Twelfth St., Philadelphia

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A Seat That Will Stand Abuse!

Here is an ideal seat for your bus equipment. It is a high back, all leather chair, with a selecied hardwood frame accurately joined and reinforced at all vital points by malleable iron braces. The 55 P Special will stand the hard usage which every bus chair is bound to receive, yet it is extraordinarily comfortable. It has spring-filled cushions over our deep, built-up spring construction and individual, spring-filled backs. The 55 P Special is mounted on double-clawed, malleable iron legs equipped with heavy rubber shock absorbers. Ask the nearest H-W sales office about this and many more of our modern, practical bus and railway seats.



If you have not received a copy of our new Bus Seat Catalogue, write for it.

HEYWOOD - WAKEFIELD COMPANY

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516 West 34th St., New York City
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DAVIS
"One-Wear"
STEEL
WHEELS
DAVIS
Triple
AMERICAN STEEL

SPECIAL COMPOSITION STEEL TRIPLE HEAT TREATED

Longer wear from Davis "One-Wear" steel wheels and less car wheel purchases is an ideal situation. It can be an actual one for you.

The triple heat treated alloy steel of the Davis Wheel gives you greater mileage. It removes to a great extent the costly maintenance item of removing, returning, and replacing car wheels. Even if your yearly car wheel expenditure is only average, Davis Wheels can make it reach a new low mark.

Here is a light wheel with a resilient plate and, it's stronger. Triple heat treatment is a part of a manufacturing process that has given the railway industry outstanding car wheel performance.

Investigate Davis "One-Wear" steel wheels.

ASF

Treated

FOUNDRIES NEW YORK CHICAGO ST. LOUIS

NOTHING TAKES THE PLACE OF LEATHER
...*For Passenger Appeal*

Passenger appeal is that intangible something that makes people ride. But it has tangible value in the additional number of fares it induces.

Nothing takes the place of leather seat coverings for passenger appeal—for comfort—for fatigueless travel. And nothing takes the place of leather for cleanliness and durability under all climatic conditions.

General Leathers are inherently passenger-appealing. And they appeal also to operators because of their fast colors, ease of cleaning and long wear.

Specify General Leathers for passenger appeal in your seat coverings, or order direct from us for replacements. Samples on request.

America's Largest Producers

GENERAL LEATHER COMPANY
Newark, N. J.

Makers of Famous Tried and Proven "00" Leathers



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Majestic Full Grain Leathers
20th Century Spanish Leathers
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These three good looking car floors are made for *crowds* to walk on

BUS service is the maximum test of flooring stamina and quality. Only the *best* can withstand the grueling, racking gaff of road strains and traffic wear.

When you specify Johns-Manville Flooring for your cars or buses, you end your flooring troubles. Neither car vibration nor shuffling feet make any damaging impression on J-M Floorings. They are especially made to do a lasting job on the railway car and motor bus whether for heavy duty or long distance service. They offer you a choice, from the lowest-cost, lifetime floor to the most de luxe colored flooring obtainable.

The long life and satisfactory service of J-M Masticoke Flooring has been well demonstrated by its extensive use on railroad coaches, Pullman cars and motor buses. Where color is desired, J-M Magnesite and J-M Tile Flooring answer every maintenance requirement on the railway car and motor bus at a comparatively low cost. Call in a Johns-Manville representative and let him help you select a flooring that meets your needs.



J-M MASTICOKE

A low-cost floor for heavy duty service



J-M TILE FLOORING

A decorative tile flooring for de luxe equipment



J-M MAGNESITE

A decorative composition flooring for general service

BUS & CAR INSULATION · REFRACTORY & INSULATING CEMENTS · FIBRE CONDUIT · ASBESTOS EXHAUST PIPE COVERING · ASBESTOS SHINGLES
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MASTICOKE & TRUSS PLATE FLOORING · ELECTRICAL INSULATING MATERIALS · FRICTION TAPE · BRAKE BLOCKS & LININGS

JM PRODUCTS

Johns-Manville

SERVICE TO TRANSPORTATION



ANOTHER GREAT TRANSPORTATION COMPANY FINDS ECONOMY IN BALANCED PERFORMANCE

The motor coaches of a midwestern transportation company travel nine million miles a year. Operating on such a large scale, the company naturally watches costs closely, and their motor coaches are run as economically as any in the country.

One of the cost-reducing methods adopted by this company was to standardize on Red Crown Gasoline and Polarine Motor Oil. A check-up of costs has shown real economy in the balanced performance these products give.

Red Crown Gasoline and Polarine Motor Oil have been refined especially to give balanced performance, to work with that harmony essential to efficient service and low cost operation. Red Crown burns clean . . . gives power and mileage. Polarine is rich and sturdy . . . supplies thorough, effective lubrication to the motor.

Try this combination in one of your motor coaches. You will find the combined operating cost of Red Crown and Polarine lower than that of any other fuel and motor oil.

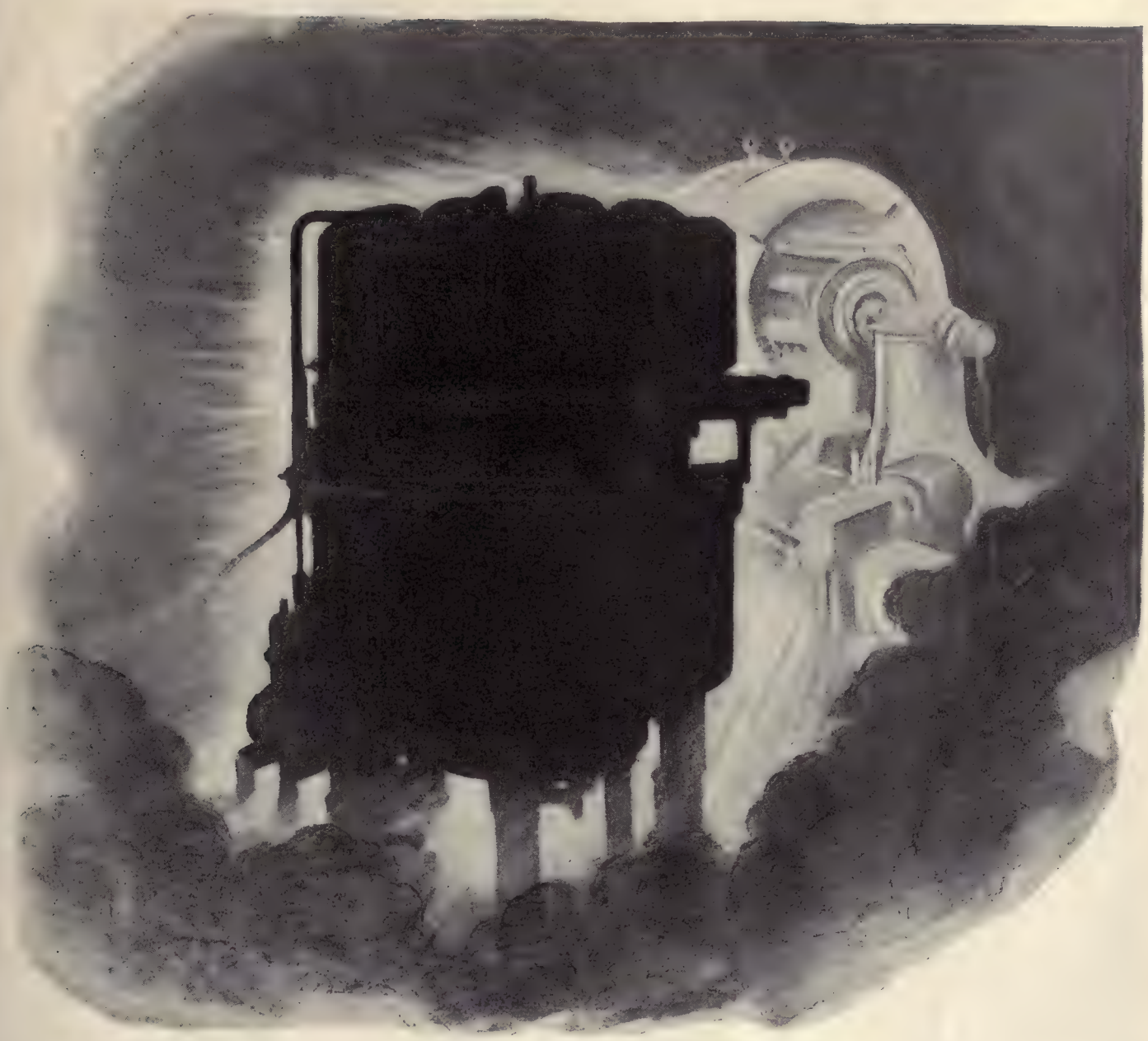
STANDARD OIL COMPANY (*Indiana*)

General Offices: 910 South Michigan Ave., Chicago, Ill.

208-A

RED CROWN ETHYL GASOLINE

New— POLARINE MOTOR OIL



PREDICTING A TOTAL ECLIPSE

The rotary converter has already entered the penumbra of the mercury arc power rectifier. Its total eclipse is as predictable and as certain as the fore-ordained eclipse of a heavenly body.

Noisy, vibrating machinery, requiring special foundations and constant attendance, is certain to disappear in the shadow of the motionless, noiseless, efficient, and dependable rectifier, which may be controlled from a distance or made entirely automatic.

American Brown Boveri has been closely identified with every noteworthy development in rectifier engineering and manufacture. It is but natural to assume the burden of sponsoring this advanced equipment to replace the older forms.

AMERICAN BROWN BOVERI CO., INC., CAMDEN, N. J.

AMERICAN BROWN BOVERI

PENNSYLVANIA

—*the show street of the*

IS LAID WITH THERMIT-WELDED CAR TRACKS

Not one or two, but miles of joints on the lines of the Capitol Traction Company have been Thermit-welded. Thermit welding has been standard practice in Washington, D. C., for many years.

In Washington, noisy, rough riding track is out of the question. Unsightly holes in paving, when joints go bad, will not be tolerated. Maintenance crews cannot be tearing up the street at frequent intervals.

So Thermit-welding has been adopted. The tracks are quiet and smooth to ride upon. The paving doesn't break up around the joints. Maintenance of joints is practically eliminated—because the joints all last as long as the rails themselves.

In short—the nearest thing to perfection in track construction.



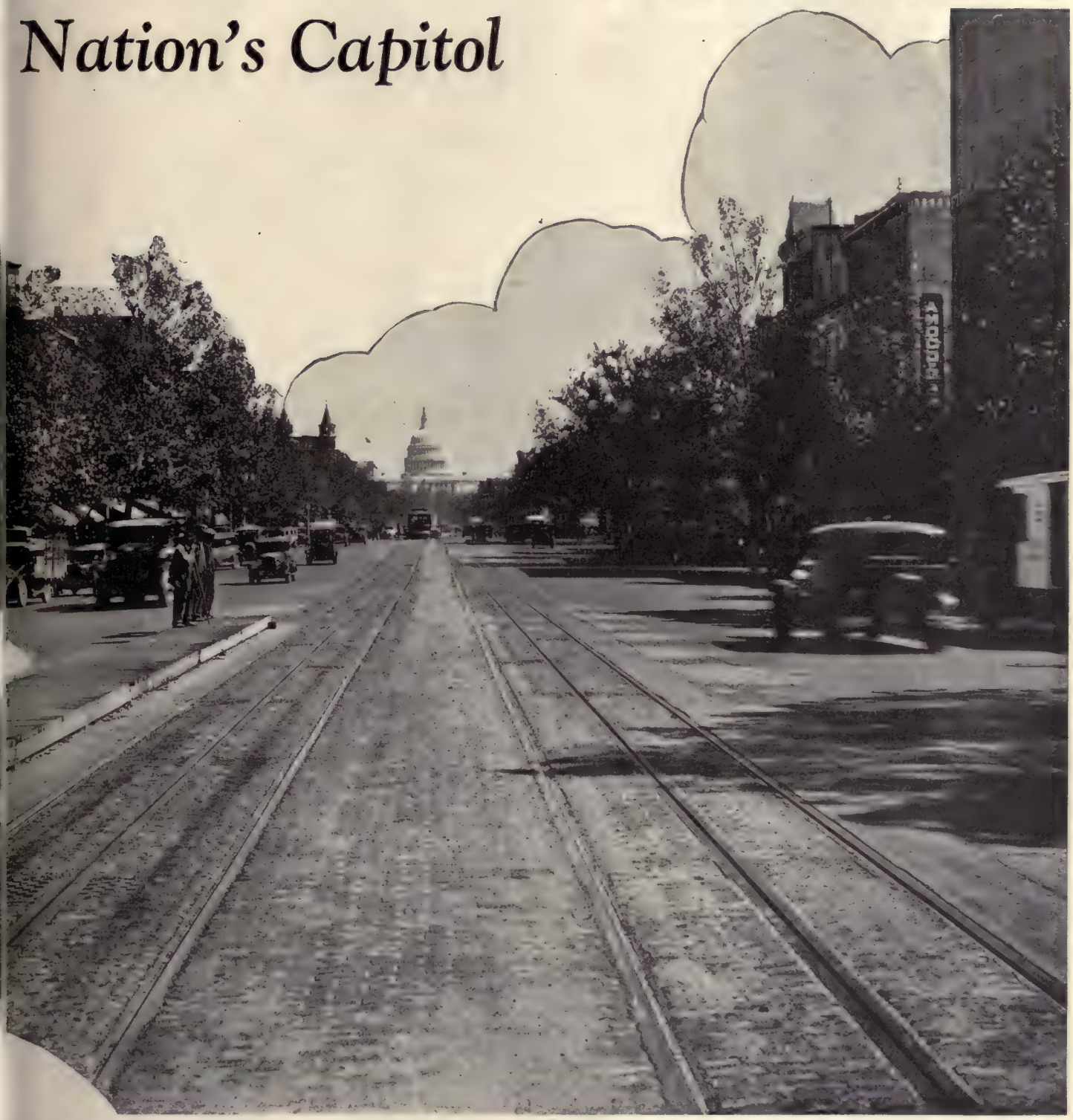


METAL & THERMIT

PITTSBURGH CHICAGO BOSTON 120 BROADWAY

AVENUE

Nation's Capitol



CORPORATION

NEW YORK, N.Y. SOUTH SAN FRANCISCO TORONTO

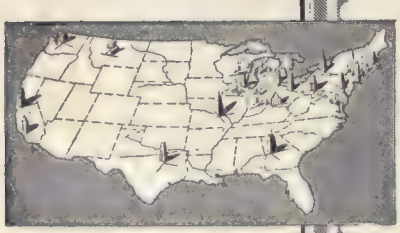
ANACONDA
from mine to consumer
REG.U.S. PAT.OFF.

TROLLEY WIRE

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Wiring Products

Magnet Wire...Power Cable ...Rubber-covered Wire... Varnished Cambric Wire... Weather-proof Wire... Flexible Cords...Armored Cable. Wires and cables for every electrical requirement, *plus* the facilities of an Engineering Department which has cooperated in the design of most of America's railway electrification projects.





Anaconda safeguards quality from mine to consumer—provides a nation-wide service, prompt, dependable, complete.

ANACONDA WIRE & CABLE COMPANY
General Offices: 25 Broadway, New York City
Chicago Office: 20 North Wacker Drive Building
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A 16-Track Carhouse Layout by LORAIN



This is another example of LORAIN'S skill and experience in making complicated layouts—and of world-wide recognition.

The 16-track carhouse layout, shown here, was furnished to Ottawa Railways Company, Ottawa, Ontario, Canada. It combines solid manganese and manganese steel insert construction.

Forty years of development enable LORAIN to meet any street railway requirement from the simplest to the most difficult piece of track equipment. When you are specifying rails, joints accessories, switches, mates, frogs, crossing or special track-work . . . when you have problems to solve or quotations to secure—remember, our nearest District Sales Office is at your service.

THE LORAIN STEEL COMPANY

JOHNSTOWN, PA.

SUBSIDIARY OF UNITED STATES STEEL CORPORATION

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Illustration: The SIXTH STREET BRIDGE over Allegheny River at Pittsburgh, Pa., selected by a national jury appointed by AMERICAN INSTITUTE OF STEEL CONSTRUCTION as the most beautiful bridge completed in 1928.

The STRUCTURAL STEEL in the superstructure of this bridge was produced by Carnegie Steel Company, and FABRICATED and ERECTED by

AMERICAN BRIDGE COMPANY

Subsidiary of United States Steel Corporation

General Offices: 71 Broadway, New York, N. Y.

Contracting offices in New York, Boston, Philadelphia, Baltimore, Pittsburgh, Cincinnati, Cleveland, Detroit, Chicago, St. Louis, Minneapolis, Duluth, Salt Lake City and Denver.

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It's seamless and bias cut

at the price of Sewn bias

Small wonder that this new Empire seamless bias cloth has gained such immediate popularity! No sewn seams to be cut out—to waste material and time. And it costs no more than sewn bias cloth yet possesses greater dielectric and mechanical strength.

Through the development of a special base cloth, this new electrical insulation has been produced. It's ideal for wrapping joints, coils and similar needs. You can obtain it in black or yellow finish, in tape form or in rolls approximately 36 in. wide. *Send for samples!*

MICA INSULATOR COMPANY

New York: 200 Varick St. Chicago: 542 So. Dearborn St.

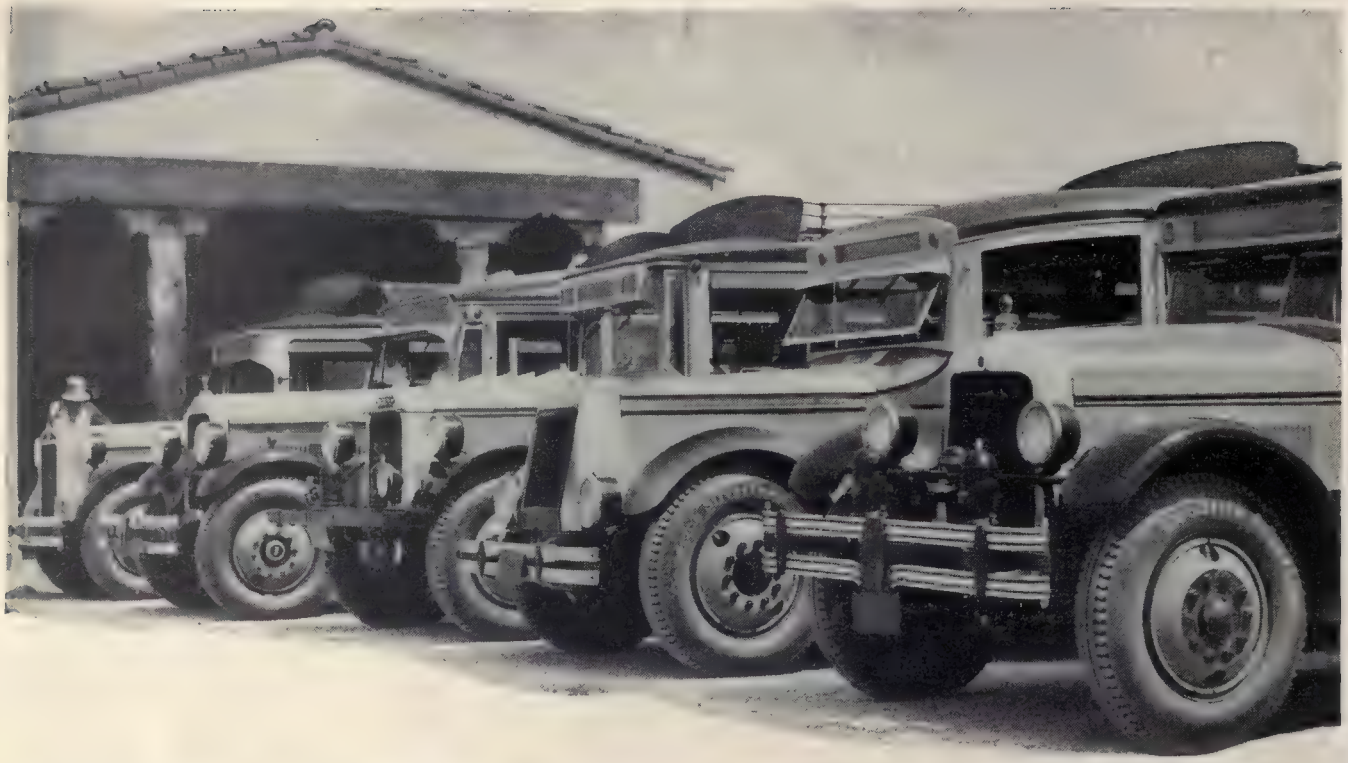
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PERFECT MICANITE INSULATOR
REG. U.S. PAT. OFF.

Electrical INSULATION

PERFECT EMPIRE INSULATOR
REG. U.S. PAT. OFF

MICA INSULATION OILED CLOTH INSULATION



RIGHT DOWN THE LINE



The new Goodrich Heavy Duty "Express" Silvertown, built for long hauls and hard wear.

Goodrich-

WHEREVER it may be—in the city, on the road—anywhere that buses operate—you'll find Goodrich giving satisfaction in longer mileage—greater savings—to representative bus lines all over the entire country.

And right down the line prominent bus operators express this satisfaction for Goodrich Silvertowns by standardizing on Goodrich—by specifying Goodrich on their new buses.

Such expression of satisfaction on the part of leading bus operators speaks for itself. Get in touch with your local Goodrich Truck and Bus Tire Distributor. Have him explain the new Standardized Service Program.

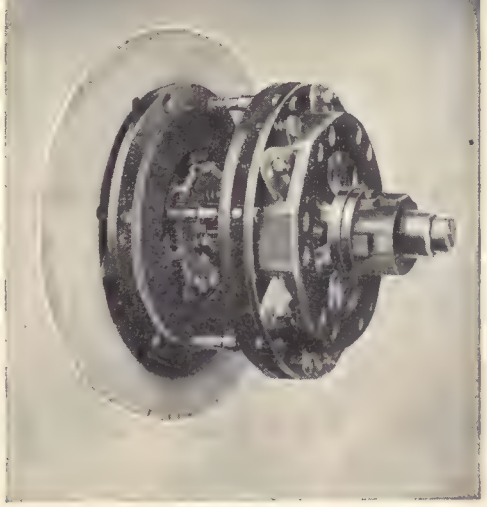
The B. F. Goodrich Rubber Company, Established 1870, Akron, Ohio. Pacific Goodrich Rubber Company, Los Angeles, Calif. In Canada: Canadian Goodrich Company, Kitchener, Ont.

Goodrich HEAVY DUTY Silvertowns

SPECIFY GOODRICH ON YOUR NEW BUSES

LONG PRODUCTS Automotive Clutches and Radiators





The Studebaker *Free Wheeling* President and Commander Eights are equipped with the Long Clutch and Radiator.

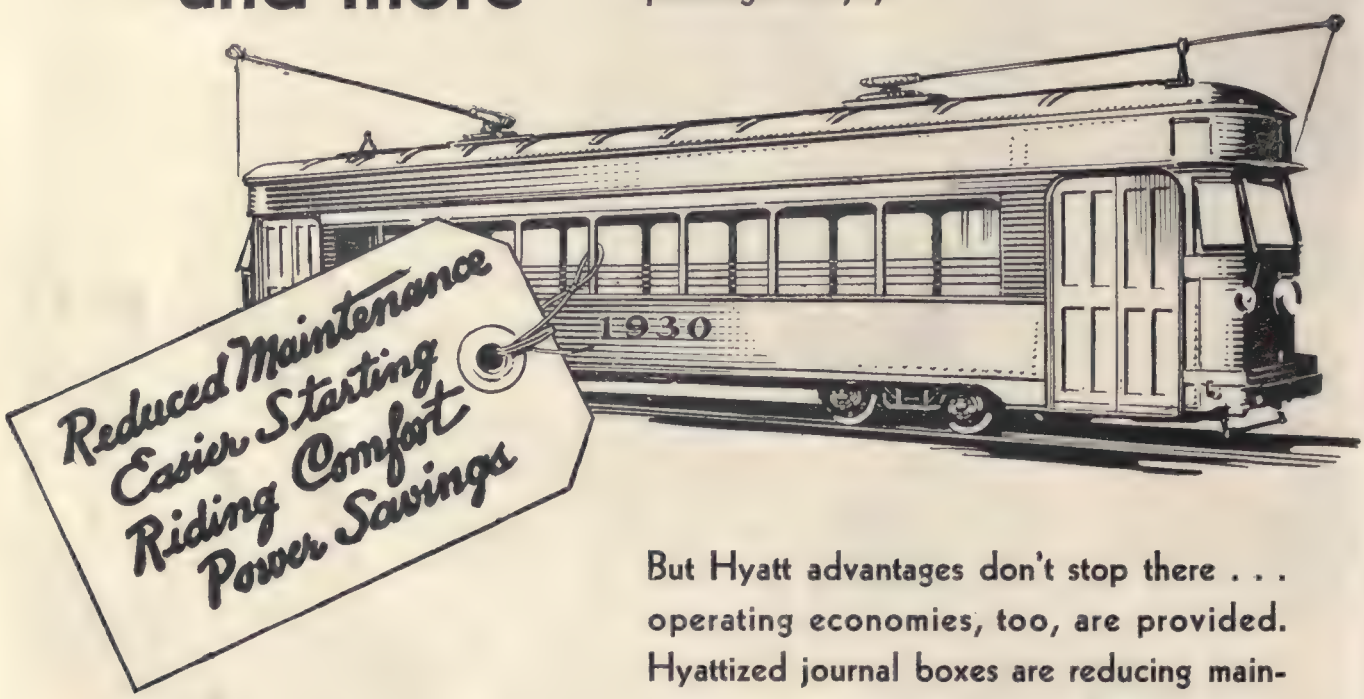
LONG

LONG MANUFACTURING CO., DETROIT, MICHIGAN

Here's What You Get —and more

Hundreds of Hyattized cars in operation on street railways and interurban lines throughout the country are proving the practicability of Hyatt Roller Bearings for journal box service.

With friction free Hyatts replacing plain brass journals, jerky starting and stopping is eliminated and substituted with smooth, quiet, joltless riding . . . the kind of riding comfort passengers enjoy.



From the standpoint of application, operation, dependability and greater riding comfort, Hyattized journal boxes have so many advantages in their favor that they are fast becoming the standard railway anti-friction bearing.

But Hyatt advantages don't stop there . . . operating economies, too, are provided. Hyattized journal boxes are reducing maintenance, saving power, and helping to keep the cars out of the repair shops.

Repeat orders from property after property is the best indication that Hyatts are making good. That Hyatt journal boxes conform to A. E. R. A. standards is another point in favor of their wide-spread use.

HYATT ROLLER BEARING COMPANY
NEWARK DETROIT CHICAGO PITTSBURGH OAKLAND

HYATT
ROLLER BEARINGS
PRODUCT OF GENERAL MOTORS

STRENGTH SAFETY *and* APPEARANCE



TUBULAR STEEL POLES

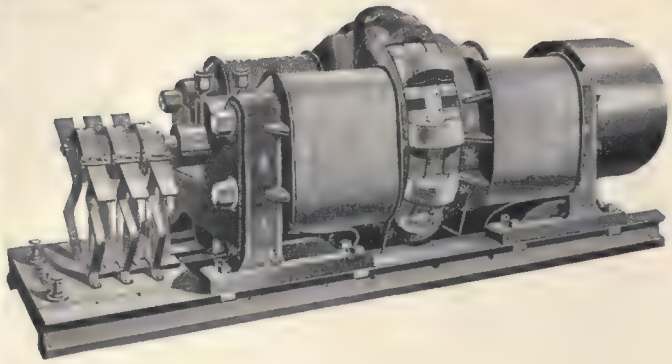
HERE is a unique combination in one pole—the three most important factors in line pole service . . . strength, safety and appearance. These three advantages offer maximum durability, adequate protection to the public, and advancement of the "city beautiful" idea—making the selection of NATIONAL Poles a most desirable investment from every standpoint.

Made by the largest manufacturer of wrought tubular products in the world, with facilities for meeting a wide range of specifications for pole construction. Ask for Bulletin No. 14, describing NATIONAL Tubular Poles, made from—

America's Standard Wrought Pipe

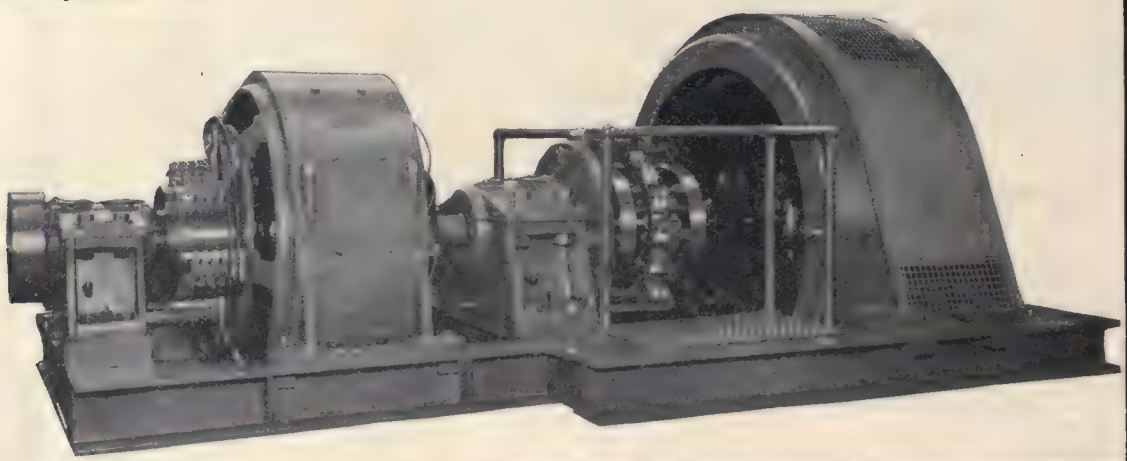
NATIONAL TUBE COMPANY, Pittsburgh, Pa.
Subsidiary of United States Steel Corporation

NATIONAL



Early type of Brush Arc Dynamo designed for operation of arc lamps in series.

better brushes GREATER POWER



...MODERN KRAMER MOTOR SET

THE BIRTH of the carbon-arc lamp marked the beginning of electricity's rapid advance in industry—an advance in which the products of National Carbon Company, Inc., played a very important role. With the coming of the carbon-arc lamp, street lamp-lighters went out of business and the era of mechanically generated electric power began.

The Brush Arc Dynamo, illustrated at the left, is typical of the first generating units used when electric street-illumination was in its infancy. Constant current was maintained by the automatic regulator which adjusted voltage to the number of lamps in operation on the series circuit. Street-lighting at that time was the entire load of power-plants.

What a change there has been since the days of the Brush Arc Dynamo! Yes, street-lighting has made tremendous progress. However, it now represents less than two per cent of the total amount of electricity used. Two-thirds of the total 1929 consumption, in fact, was applied to turn the wheels of industry.

Witness, therefore, giant machinery able to carry huge loads, like the Kramer Motor Set shown at the right. Delivering a constant horse-power output at adjustable speed with variable voltage and frequency impressed upon the commutating elements. It presents a difficult commutation problem — one which would have been too much for the commutator-brushes of only a few years back, not to mention those of the Brush Arc Dynamo days.

National Carbon Company, Inc., with its years of leadership in brush manufacture, offers a National Pyramid Brush to meet the needs of many difficult problems of brush application in modern industry.

NATIONAL CARBON COMPANY, INC.

Unit of Union Carbide UCC *and Carbon Corporation*

Carbon Sales Division SILVER STRAND CABLE TRADE MARK REGISTERED Cleveland, Ohio

Branch Offices and Factories

New York Pittsburgh Chicago Birmingham San Francisco



They don't have to REMEMBER

CARNEGIE STEEL TIES

after their installation

TRACK problems may properly be forgotten where Carnegie Steel Ties are used in track construction. These ties provide the foundation for a smooth, repair-free track—a track that saves wear and tear on rolling equipment and greatly enhances its comfort. In many instances where Carnegie Ties have been in service for fifteen or twenty years, rails have been taken up for renewal to find the ties in perfect condition.

Plan to include Carnegie Steel Ties in your track construction program. Their unit cost (cost per foot of track per year) is considerably less than for wood ties. They will prove an investment you will remember with satisfaction—and forget with complacency, as far as troubles are concerned.

Catalogue on request.

CARNEGIE STEEL COMPANY

Subsidiary of United States Steel Corporation

PITTSBURGH PENNA.

86



Timken Bearing Equipped From Front Truck To Tender

For the first time in the history of railroading, a locomotive has been placed on a full anti-friction basis, and Timken is proud to have the privilege of pioneering this great forward step in the interest of American railroad advancement.

It is a logical development following the great success which has been attained with Timken Bearing Equipped railroad passenger cars and electric railway cars during the past few years.

Every wheel of the Timken locomotive turns on Timken Tapered Roller Bearings—front truck wheels, driving wheels, trailer truck wheels and tender truck wheels.

There are 32 Timken bearings in the wheels and booster, and in addition, Timkens are used in the speed driver of the valve pilot and in the train control governor.

Reduction of frictional resistance in the front truck, trailer and tender truck wheels through the use of Timken Bearings is placed at approximately 12%, and in the driving wheels at from 12% to 50%, depending upon load and track conditions.

And largely as a result of the higher rotative speeds secured through the elimination of friction, combined with refinements in the design of reciprocating parts, the Timken locomotive is equally efficient in both fast freight and passenger service, having the power necessary for the former and the speed for the latter.

The performance of Timken Bearings in this engine is expected to radically revolutionize locomotive operation and operating costs, and to eliminate a considerable proportion of motive power maintenance charges as a result of power conservation, lubrication economy, radial-thrust load capacity and greater bearing stamina secured through Timken tapered construction and Timken-made steel—the combination that is licking Industry's toughest jobs in all types of machinery. The Timken Roller Bearing Company, Canton. Ohio.

TIMKEN *Tapered Roller* **BEARINGS**



GARY

WROUGHT STEEL WHEELS

The name ILLINOIS on wrought steel wheels assures the railroads safety, dependability and long life. These three factors all contribute to the success of the Gary Wrought Steel Wheel.

Our Wheel Engineers are at Your Service.



Illinois Steel Company
Subsidiary of United States Steel Corporation
General Offices
208 South La Salle Street, Chicago



DETROIT STREET RAILWAYS

DETROIT, MICHIGAN

—Another great Bus Fleet
equipped with the

U. S. ROYAL

HEAVY SERVICE

UNITED STATES RUBBER COMPANY WORLD'S LARGEST PRODUCER OF RUBBER

6

REASONS WHY Socony Banner Gasoline will save you MONEY

Here are the reasons why this new Socony Banner Gasoline cuts operating costs—why it will pay you to try it in your fleet of buses.

1 **It is quick-starting.** The proper amount of low boiling points in this new Socony Gasoline gives quickest starting — saves your battery.

2 **It has instant pick-up.** The intermediate range of boiling points in this new Socony Gasoline gives you the quickest pick-up.

3 **It has more power.** The proper percentage of power-producing boiling points in this new Socony Gasoline gives additional power which you are sure to feel the first time you try Banner.

4 **It gives more mileage.** The exacting range of boiling points in this new Socony Gasoline gives you more mileage at less cost because it burns clean with a minimum of carbon and dilution.

5 **It is anti-knock.** Banner is made only from those crude oils which have a natural high anti-knock value.

6 **It is gum-free.** The annoyance and expense resulting from gum-sticking valves and other parts are entirely absent.



This latest type of gasoline-electric bus, operated by the Capitol District Transportation Company in Albany, Troy, Rensselaer and Cohoes, N. Y., is fueled exclusively with New Socony Banner.

SOCONY

BANNER GASOLINE SPECIAL GASOLINE *plus* ETHYL

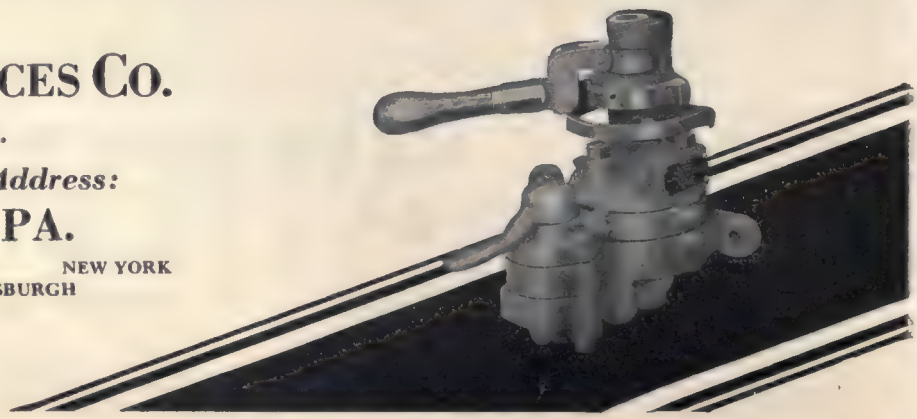
MOTOR OIL AIRCRAFT OIL

STANDARD OIL COMPANY OF NEW YORK

The SAFETY CAR CONTROL EQUIPMENT

Helps Youngstown Win Coffin Award

Among the principal factors that enabled the Youngstown Municipal Railway to win the Coffin Award this year are: "More riders and more revenue; friendly public; lower costs and increased reliability of service; increased safety for riders, employes and the public . . ." These improvements invariably follow in the wake of Safety Cars—used exclusively by this company and other winners of the Coffin Award.



SAFETY CAR DEVICES CO.

OF ST. LOUIS, MO.

Postal and Telegraphic Address:

WILMERDING, PA.

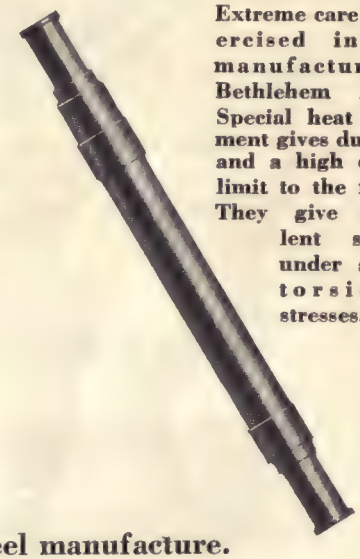
CHICAGO SAN FRANCISCO NEW YORK
WASHINGTON PITTSBURGH



GOOD WHEELS

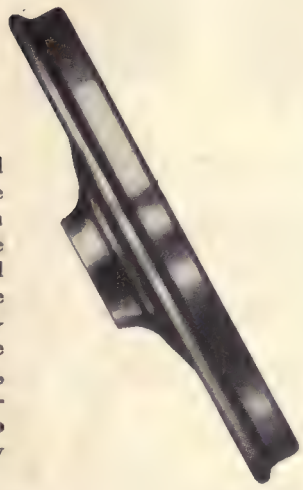
HELP KEEP THE CARS RUNNING

A modern electric railway car represents a substantial investment. Only the best material and equipment should be used because once the car is placed in operation it is highly important that it give long, continuous service with as few interruptions as possible for replacements and repairs. That is why so many electric cars are being equipped with Bethlehem Wrought Steel Wheels.



Extreme care is exercised in the manufacture of Bethlehem Axles. Special heat treatment gives ductility and a high elastic limit to the metal. They give excellent service under severe torsional stresses.

Bethlehem Wheels are made from good steel. They are rolled and forged, critically inspected at every step in the process of manufacture. They are made by men who are thoroughly experienced in every detail of wheel manufacture.



Five distinct forging and rolling operations are necessary to produce a Bethlehem Wheel. The forging gives the metal toughness and density, the rolling establishes a uniform grain structure throughout the wheel, virtually eliminating crystallization and reducing to a minimum the possibility of breakage.

Due to their strength, endurance, safety, and wearing qualities. Bethlehem Wrought Steel Wheels are being extensively adopted by electric railway companies. You are invited to make a thorough investigation of the many advantages of Bethlehem Wheels.

BETHLEHEM STEEL COMPANY

General Offices: Bethlehem, Pa.

District Offices: New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Pittsburgh, Buffalo, Cleveland, Cincinnati, Detroit, Chicago, St. Louis

Pacific Coast Distributor: Pacific Coast Steel Corporation, San Francisco, Los Angeles, Portland, Seattle, Honolulu.

Export Distributor: Bethlehem Steel Export Corporation, 25 Broadway, New York City

BETHLEHEM

WROUGHT STEEL WHEELS

Two Famous Slogans



SKF alone is ABLE to put the *right* bearing in the *right* place because SKF alone makes practically every type of anti-friction bearing required.

It costs more to REPLACE a poor bearing than to buy the best that SKF ever produced. Performance takes preference over price.

Three Famous Letters

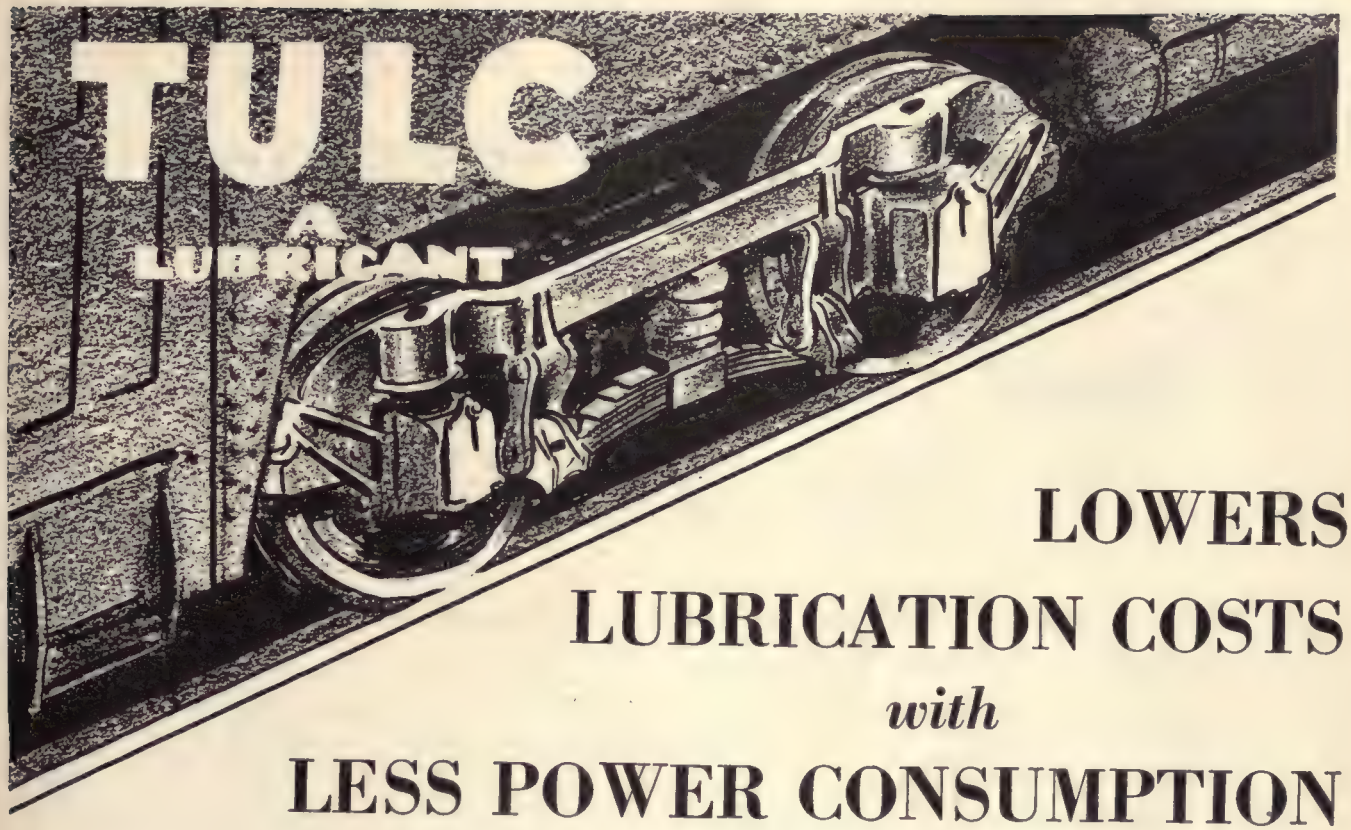
SKF

THE mark of a world-wide organization manufacturing anti-friction bearings of the highest standards and sold as

The highest priced Bearings in the world

2566

SKF INDUSTRIES, INC., 40 East 34th Street, New York



LOWERS LUBRICATION COSTS *with* LESS POWER CONSUMPTION

RESULTS UNDER ACTUAL OPERATING CONDITIONS:

The cars were run in regular service in this test.

- **The TULC cars ran 4,105 and 7,516 more miles than cars lubricated with "Other Lubricant".**
- **The TULC cars cost less for packing, oil and installation by $1.59 per car.**
- **The TULC cars did not require any addition of oil or packing. The cars lubricated with "Other Lubricant" cost $6.01 and $5.95 for maintenance.**
- **The TULC cars consumed less power and this cost decreased with additional mileage. Savings in power for TULC cars was found to be 1.5% and 3.2%.**

The* UNIVERSAL LUBRICATING CO.,** ***Cleveland, Ohio

"How's
BUSINESS?"

Read your Business Paper —and FIND OUT!

"How's business?" Morning, noon, and night—in the office, in the store —on the street, on the highway—it's the most asked question.

"How's business?" The merchant asks his customer — the salesman asks his prospect—the doctor asks his patient.

Every time it's asked, it adds to alarm. Every time it's answered, it adds to confusion.

Yet all the while the real answer is as near as your desk. *Look in your business paper.*

The editor of your business paper is the *first* man to know the trend that business is taking. He can foresee a decline. He can forecast an upturn. He knows how business is—*because it is his business to know.*

Across his desk the facts of business pass day in, day out. He marshals them, organizes them, inspects them — casts out intruding rumors, lifts up significant truths—projects for you a picture of business as it is—and will be.

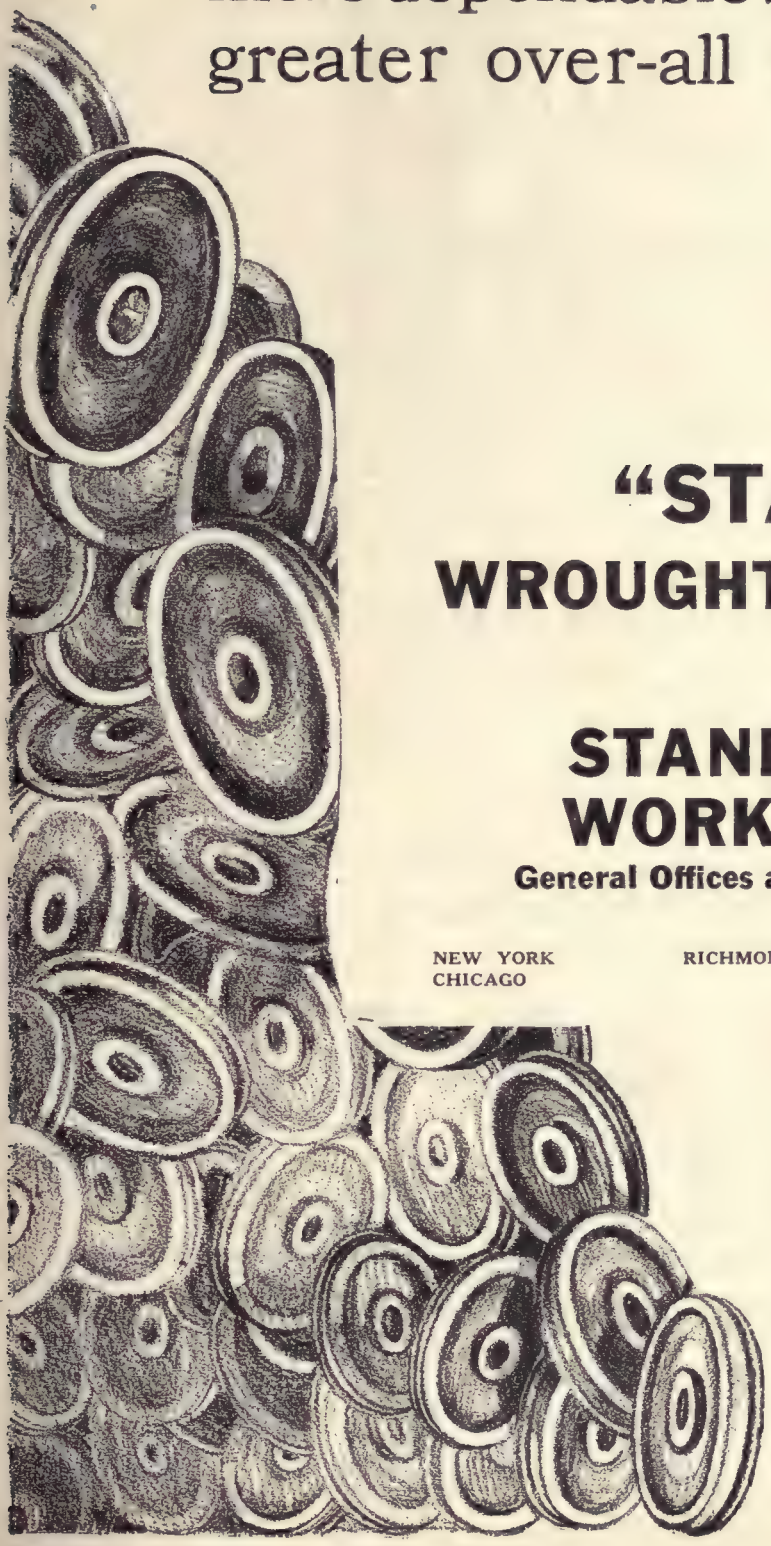
He does more—he helps you shape your plans to urgent present needs. He gathers reports of how others in your circumstances have increased sales; cut costs; reduced inventories; improved styling; found better, shorter, quicker ways to solve a thousand heckling problems.

Do you want to know how business *really* is—how soon it is going to be better? Read your business paper with a care you never gave it before. You will find there — briefly, intelligently, authentically—the answer to your question.

THIS SYMBOL *identifies an A B P paper . . . It stands for honest, known, paid circulation; straightforward business methods, and editorial standards that insure reader interest . . . These are the factors that make a valuable advertising medium.*

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TWO-NINETY-FIVE MADISON AVENUE : NEW YORK

FOR increased mileage, more dependable service and greater over-all economy.



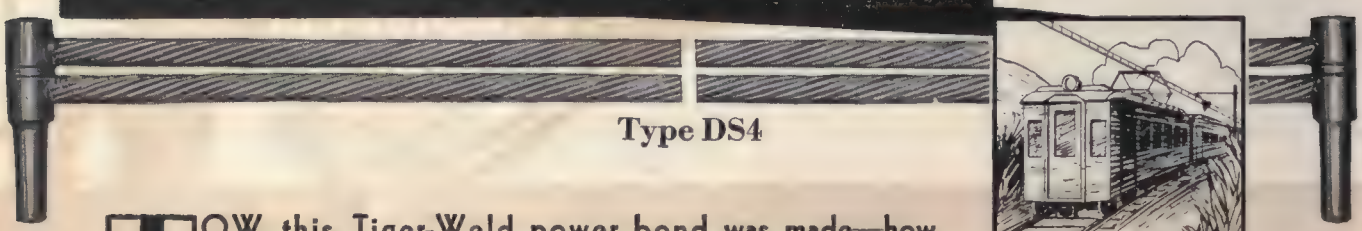
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WROUGHT STEEL WHEELS

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Now..a new Power Bond with Strength to Spare ..Yet Capable of Carrying Necessary Current Loads..



Type DS4

Look for the Double Ring Mark in the center of the Terminal Head. It is a sign of Superior Quality and Workmanship.

HOW this Tiger-Weld power bond was made—how American Steel & Wire Company Engineers solved the problem of strength—without sacrificing the ability to carry necessary current—is a story of achievement that you will want to know about in detail. Especially so—since its inception means increased efficiency and lower operating costs. It will pay you to write for interesting literature and detailed information.

Designed for use on multi tracked A. C. systems. The Pennsylvania Railroad adopted Type DS-4 Bonds for the electrification from North Philadelphia to Trenton and Norristown.

TIGER-WELD POWER BONDS

AMERICAN STEEL & WIRE COMPANY

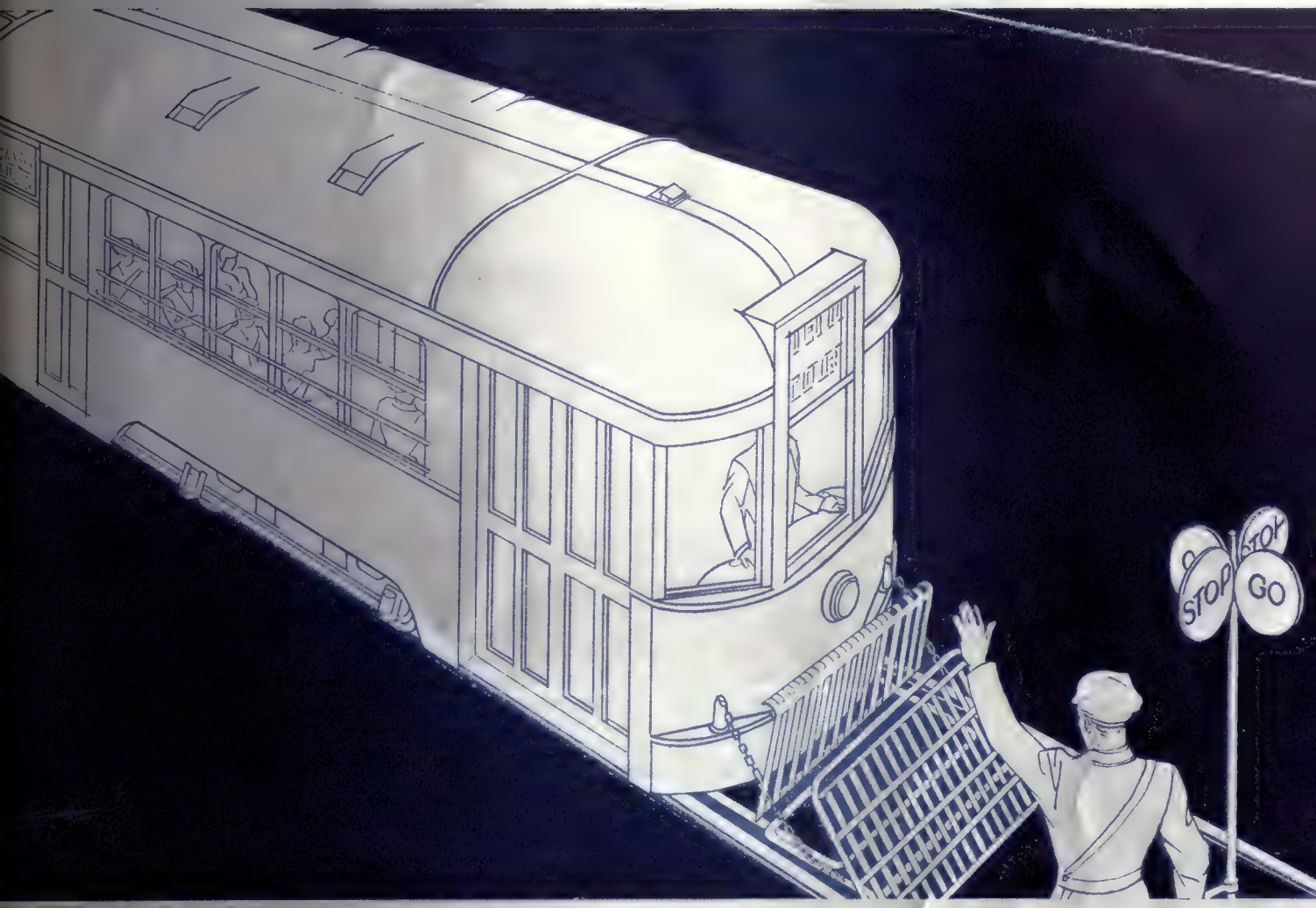
SUBSIDIARY UNITED STATES STEEL CORPORATION

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Other Sales Offices: Atlanta Baltimore Birmingham Boston Buffalo Cincinnati Cleveland Dallas Denver Detroit Kansas City Memphis Milwaukee Minneapolis-St. Paul Oklahoma City Philadelphia Pittsburgh Salt Lake City St. Louis Wilkes-Barre Worcester

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Relieved of surplus dead-weight Aluminum Street Cars almost stop on a dime v v v

ALCOA ALUMINUM

STRONG TO BEAR BURDENS · · · LIGHT TO MOVE



6647 pounds of Alcoa Aluminum used
2,901 pounds of dead-weight saved

6,647 lbs. of Alcoa Aluminum were used on the body, underframe and trucks of this car built and operated by Cleveland Railway Company. Dead-weight was reduced 12,901 lbs.

Light weight street cars, such as this one, can be stopped quickly and smoothly. They have a pick-up that almost equals the modern automobile.

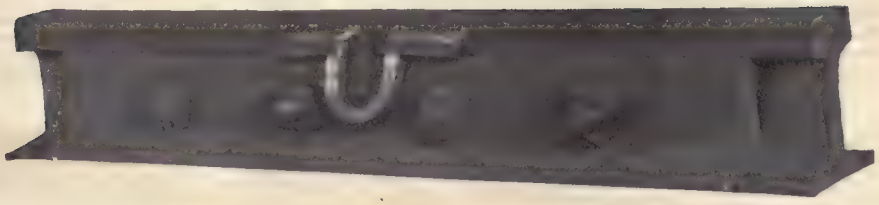
One of these days you'll have light weight cars of Alcoa Aluminum on your system. They last longer, because Alcoa Aluminum has a high resistance to corrosion. They lower running time. They permit the use of lighter and less expensive motors. They require less power to move them, cause less wear and tear on tracks and road-bed.

The light, strong Alloys of Alcoa Aluminum have tensile strength as high as 55,000 lbs. per square inch minimum. They are as easy to fabricate as steel.

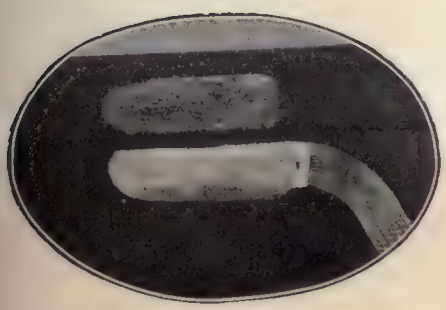
Our nearest office will gladly give you full particulars as to the application of Alcoa Aluminum to any transportation need. ALUMINUM COMPANY *of* AMERICA; 2463 Oliver Building, PITTSBURGH, PENNSYLVANIA.

ALCOA ALUMINUM

Type ET
Brazed Bond



There's Romance in Rail Bonds



Over 30,000 lbs. were required to shear this terminal from the rail. The area of copper *left on the rail* from the shearing process, is just eight times the cross section area of the bond. Every individual strand is united to the rail in a solid braze which insures the maximum bond conductivity, without injury to either the rail or the copper of the bond.

UNHEARD, unseen, unsung, yet vitally necessary to economical operation of Electric Railways, there's a tinge of romance in Rail Bonds.

New drives and new equipment are handicapped by inefficient bonds. Motor maintenance is higher, power losses are greater, because of the lowered efficiency of the track return circuit.

Regardless of type, Erico Rail Bonds are noted for their ease of application, their tenacious adherence to the rail, *their ability to raise voltages to normal and reduce power costs.*

Erico Bonds, clinging low to the rail, tell a convincing story high up in the front office. Try them.

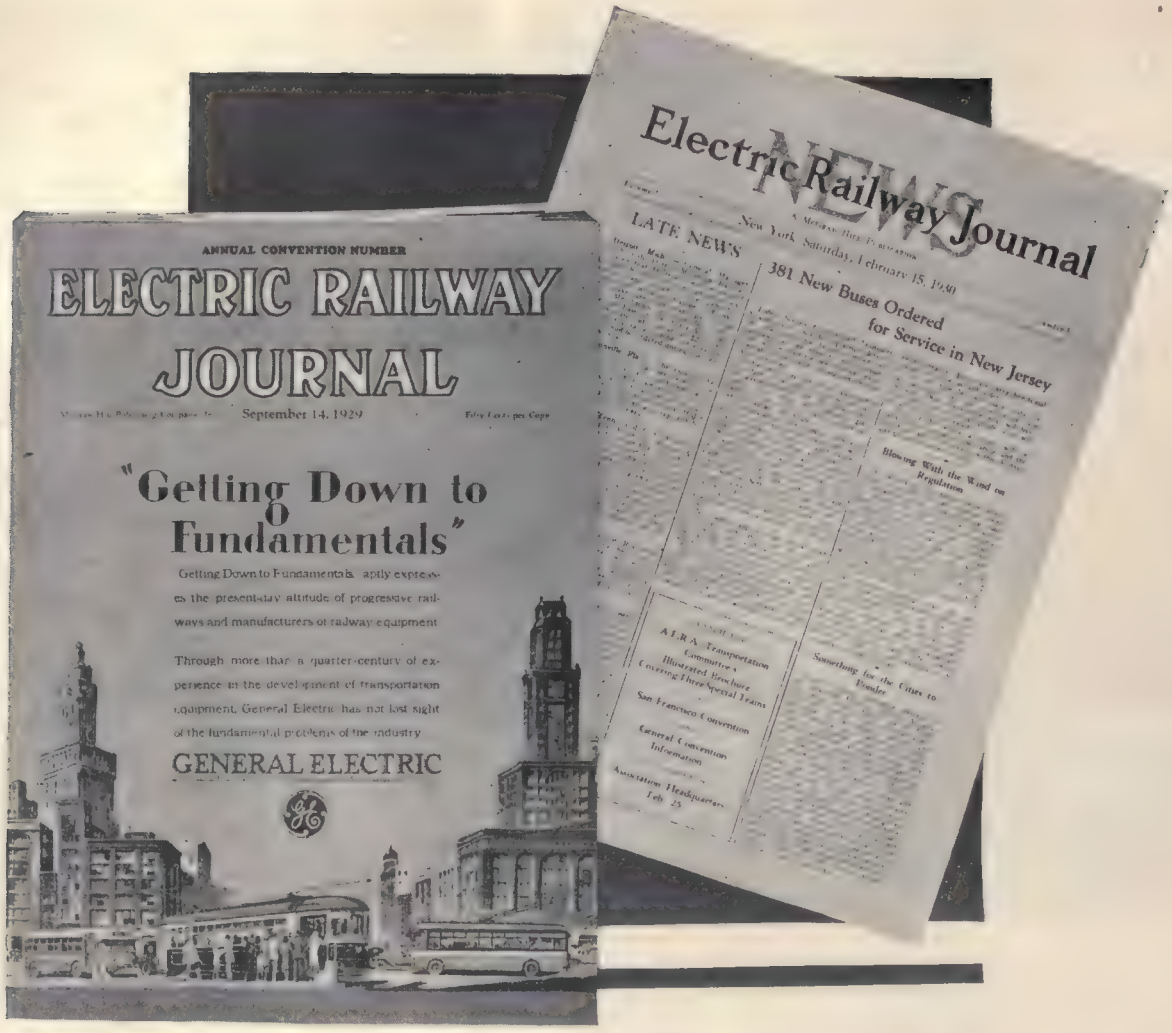
The Electric Railway Improvement Company

2070 E. 61st Place, Cleveland, Ohio



Type AT
Steel Arc Weld Bond
Applied

ERICO
RAIL BONDS AND BONDING OUTFITS



You need *both*— The Journal *plus* The News

THE monthly edition of *Electric Railway Journal* gives you comprehensive articles on changing trends, technical advances and broad problems facing the industry.

And the E.R.J. *News*—the newspaper of the field—presents terse, accurate news dispatches of fare changes . . court decisions . . financial and corporate notes . . new legislation . . association meetings . . personal notes . . all the vital news of the industry.

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Subscription price of the E.R.J. *News* is low—only $2 for the complete year's service of thirty-nine issues (it appears on thirty-nine Saturdays during the year). Foreign rate, $4 a year. Sold in combination with the monthly edition of *Electric Railway Journal* for $5 a year domestic and $9 foreign.

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Based upon actual accounting practices of America's leading public utilities—

Accounting Procedures for Public Utilities



By

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Assistant Director, Business Research Corporation; Consultant in Public Utility Management and Procedure.

and

D. E. KNOWLES, C. P. A.

Lecturer in Public Utility Accounting Procedures, School of Commerce, Northwestern University; Industrial Engineer, Business Research Corporation.

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THIS book, based upon the actual accounting practices of America's most successful utilities, comprehensively covers the whole field of public utility accounting.

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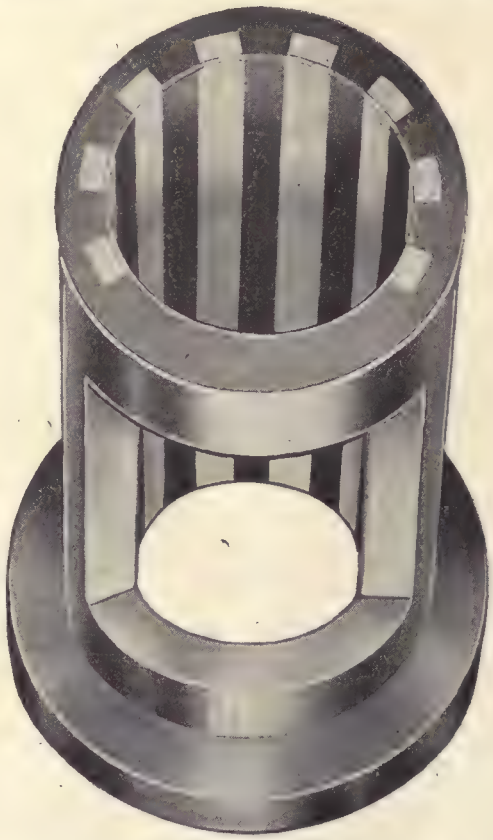
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An ideal Combination of Bronze and Babbitt in alternating strips

This Bearing:

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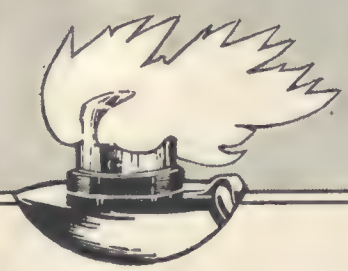
Our specialists will be glad to assist in solving your Armature Bearing, Babbitt Metal, Trolley Wheel and Harp problems. Their long experience can be of real help to you.

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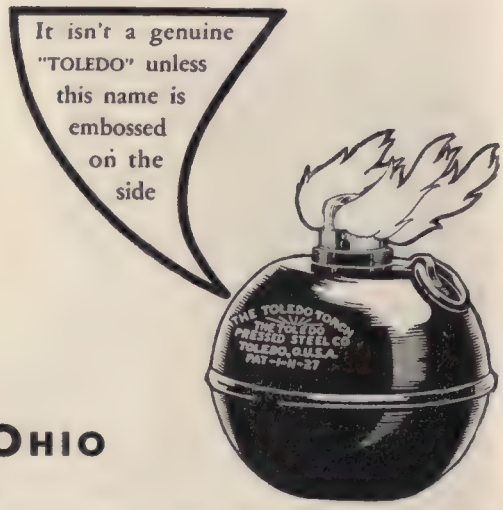
Only the TOLEDO has the efficient Economy Burner



—the burner that cuts fuel cost in two, eliminates wick consumption, produces a flashing, unquenchable flame—a warning in light that cannot be ignored. No other torch has this burner in so perfected a form.

The Toledo Torch—unbreakable, storm-proof, self-righting, theft-proof—is used by thousands of contractors, highway departments, public utilities, to the exclusion of all other traffic lights.

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Manufacturers of The Toledo Horse—the ideal highway barricade



Speed with Safety Pays the Largest Dividends

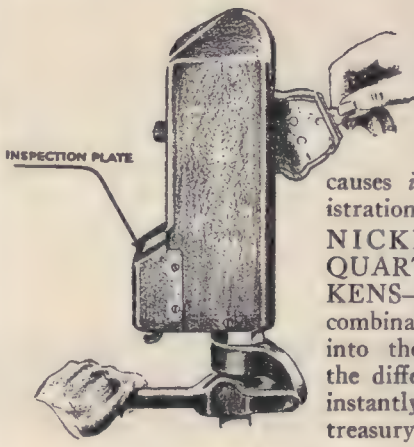
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Quality Products

for Power and Lighting assure safe, dependable service.

John A. Roebling's Sons Company, Trenton, N. J.



Fare Collection,

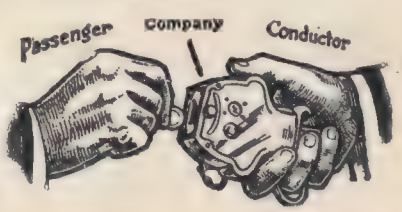


to avoid the old temptations and leaks, *necessitates the coin-slot mechanism.*

Coin - insertion causes *instantaneous* registration *by the patrons.* NICKELS, DIMES, QUARTERS or TOKENS—all or in various combinations, are paid into the *one* coin-slot—the different values being instantly assured your treasury.

MONEY METERS are furnished in either *portable* or *stationary* form and are mechanically unbeatable for trolleys and buses.

This *at-the-source* protection will probably add 4% to 10% to your present passenger income.



Money-Meters, Inc. (Successor to Rooke Automatic Register Co.)
3209 Book Tower, Detroit, Mich.

A Tape That Workmen Like To Use

WORKMEN like DUNDEE "A" because it sticks in any kind of weather and because its edges are clean and don't fray.

Primarily, however, DUNDEE "A" is popular because it is a true friction tape. The adhesive compound is calendered into and through the fabric under heavy pressure. This gives a perfect bond between fabric and adhesive, making a more reliable product than tapes which are made by merely spreading the adhesive onto the cloth.

For all friction tape uses where low price is a factor, specify "DUNDEE 'A' " and get the most for the money.



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Founded 1878
THE OKONITE-CALLENDER CABLE COMPANY, INC.
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F. D. Lawrence Electric Co. Cincinnati, O.
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Cuban Representatives: Victor G. Mendoza Co., Havana

Long Poles Made by Splicing

ON page 531 of the August issue of the Electric Railway Journal there appears an illustrated article carrying the above heading and featuring the cuts appearing below.

This prominent Electric Railway Company finds M.I.F. Reinforcing and Extension Clamps indispensable, not only for such special tempo-



At left—Pole lengthened by splicing to support horizontal arm for attaching trolley wires. At right—Extra long pole made by splicing two poles using M.I.F. Reinforcing Clamp.

rary construction work, but also for permanent construction and maintenance of old poles corroded at ground-line or at upper joints.

There is a Reinforcing and Extension Clamp or Pole Mount in the M.I.F. patented line for every normal requirement of operation with tubular iron poles.

Our Insulated Suspension Hangers for signal conductors merit your close consideration also—as well as our Guying Specialties, including the popular P132 Guy Hook; Williams Pole Mounts for salvaging wood poles decayed at ground-line; Suspension Clamps for attaching aerial cable messengers to wood poles; Crossarm Gains for wood and tubular poles; etc.

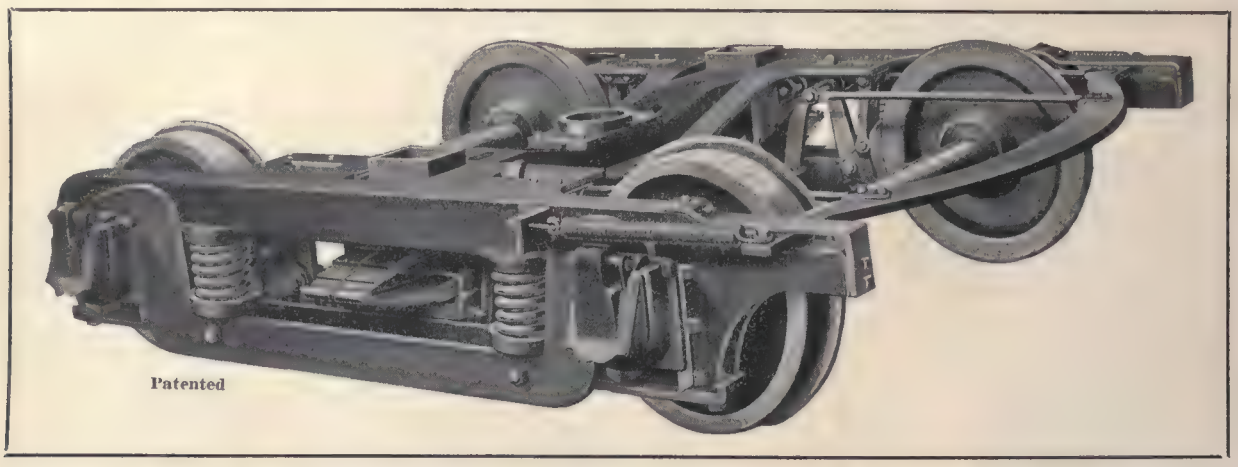
Send for complete data on Specialties of interest to every active Electric Railway Co. Samples of smaller items will be sent for inspection and field trial on receipt of data on requirements to be met.

MALLEABLE IRON FITTINGS COMPANY
Pole Hardware Department
Factory and New England Sales Offices:
Branford, Conn.
New York Sales Office:
Thirty Church Street
Canadian Mfg. Distributor:
LINE & CABLE ACCESSORIES, Ltd., Toronto

A simple, rugged truck that is economical

These trucks prove a big factor in economical street railway service. Steel frames, including cross and end transoms, cast in one strong unit. Pedestals cast integral with frame are machined and protected from wear by renewable, hardened spring steel liners.

Commonwealth Trucks

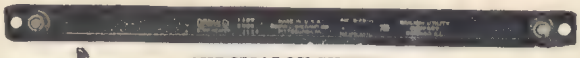


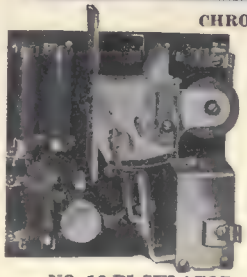
GENERAL STEEL CASTINGS CORPORATION

EDDYSTONE, PENNA. *GRANITE CITY, ILLINOIS*

Utility Car Heaters fitted with

ENCLOSED HEATING elements carry the Underwriters' Laboratories Label. They give 100% energy output for what you put in.


CHROMALOX SHRIP


NO. 10 REGULATOR

UTILITY HEAT REGULATORS economize in current consumption.

UTILITY HONEY-COMB VENTILATORS keep the air pure and wholesome.

Car Comfort with Utility Heaters Regulators Ventilators

RAILWAY UTILITY COMPANY
2241-47 Indiana Ave., Chicago
J. H. DENTON, *Eastern Mgr.*
1328 Broadway, New York

TUCOLITH FLEXOLITH

THE FLOORING THAT HAS MET WITH GENERAL APPROVAL IN THE

ELECTRIC RAILWAY FIELD

TUCO PRODUCTS CORP.
30 CHURCH ST., NEW YORK
Peoples Gas Bldg.,
122 South Michigan Ave., CHICAGO

TRACK maintenance drops a heavy burden

*Patented
July 6, 1926
No. 1591706



The NEW Scientifically designed . . . WHARTON CROSSING

NO LONGER is track maintenance on the fifty leading roads that have installed the new Wharton crossing heavily burdened with excessive crossing costs »»» For these roads are no longer dependent on crossings not scientifically designed and engineered to meet the severest tests of service »»» The new Wharton crossing is the first and only crossing scientifically designed and built to withstand the ceaseless pounding of locomotives, cars and loadings. It will give far longer service, and appreciably lower crossing maintenance under any operating condition »»» Learn more about the design of the new Wharton crossing and the service it is giving on leading roads. Ask for bulletin 1 C.



William Wharton Jr. & Co., Inc.
EASTON, PENNSYLVANIA
SALES OFFICES: Pittsburgh Chicago Houston Montreal New York
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JOHNSON FARE COLLECTING SYSTEMS

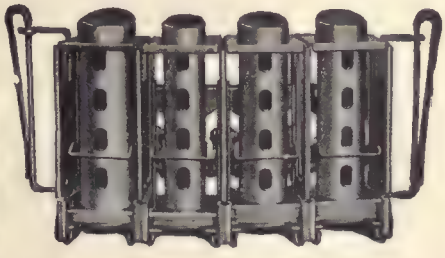


Johnson Electric Fare Boxes and overhead registers make possible the instantaneous registering and counting of every fare. Revenues are increased 1½ to 5% and the efficiency of one-man operation is materially increased. Quicker boarding of passengers with resultant reduction in running time for the buses. Over 5,000 already in use.

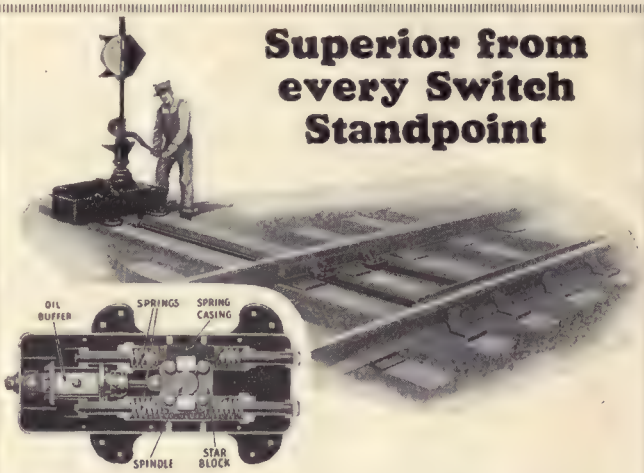
When more than three coins are used as fare, the Type D Johnson Fare Box is the best manually operated registration system. Over 50,000 in use.

Johnson Change-Makers are designed to function with odd fare and metal tickets selling at fractional rates. It is possible to use each barrel separately or in groups to meet local conditions. Each barrel can be adjusted to eject from one to five coins or one to six tokens.





Johnson Fare Box Co.
4619 Ravenswood Ave., Chicago, Ill.



Superior from every Switch Standpoint

For hand operation or for automatic operation where switches are trailed through, Ramapo Three-in-One Switch Stands embody every refined improvement. Each Switch Stand combines

1. An independent, rigid switch stand for hand operation.
2. A spring mechanism for automatic return of points.
3. An oil buffer to retard the return of points and prevent slamming.

Increased safety, ease of installation, low cost of maintenance and protection to switch points are features of this improved design.

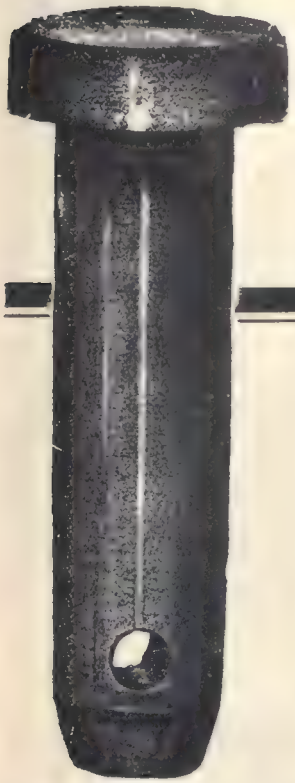
Send for bulletin No. 100 which describes it.

RAMAPO AJAX CORPORATION
RACOR PACIFIC FROG AND SWITCH COMPANY, Los Angeles · Seattle
CANADIAN RAMAPO IRON WORKS, LIMITED, Niagara Falls, Ontario

General Offices — 230 PARK AVENUE, NEW YORK
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McCORMICK BUILDING, CHICAGO
METROPOLITAN BANK BLDG, WASHINGTON
BUILDERS EXCHANGE BLDG, ST. PAUL

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Hillburn, New York, Niagara Falls, N.Y. Chicago, Illinois, East St. Louis, Ill.
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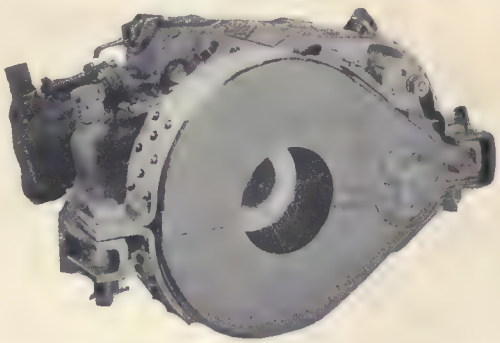
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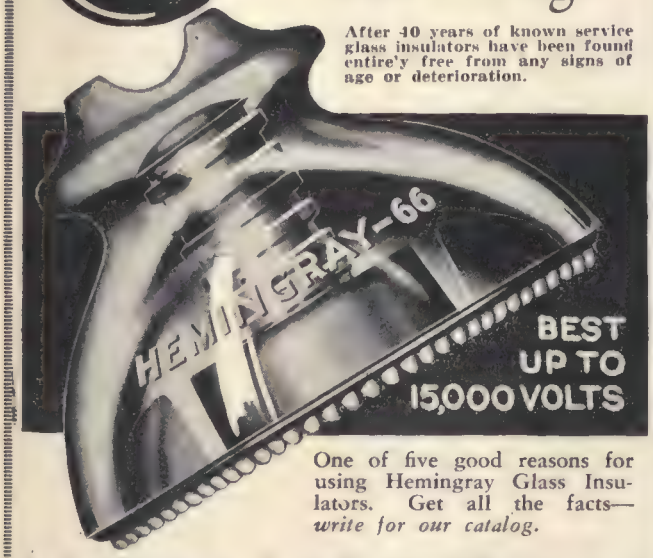
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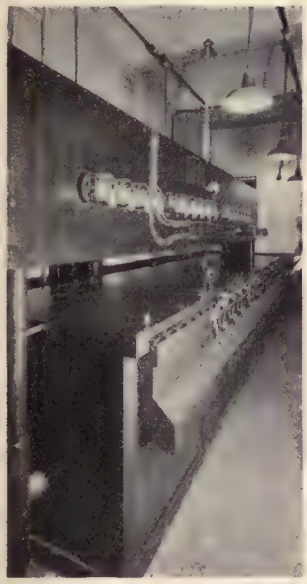
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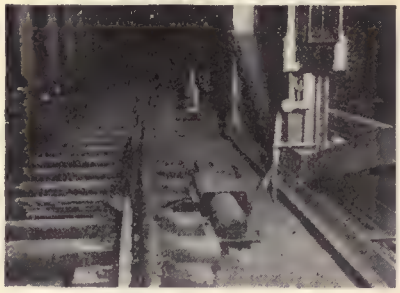


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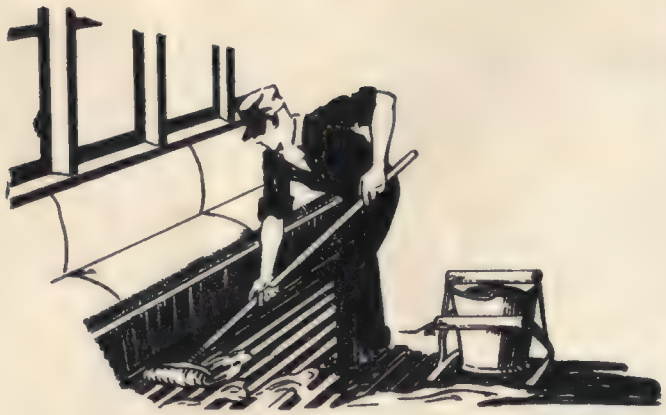
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ALPHABETICAL INDEX

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	Page
Allied Engineers	88
Aluminum Co. of America	Insert 75-76
American Bridge Co.	52
American Brown Boveri Corp	47
American Car Co.	Third Cover
American Steel & Wire Co.	74
American Steel Foundries	42-43
Anaconda Wire & Cable Co.	50
Beeler Organization	88
Bemis Car Truck Co.	84
Bender Body Co., The	92
Bethlehem Steel Co.	69
Bibbins, J. Roland	88
Brill Co., The J. G.	Third Cover
Buchanan & Laying Corp.	88
Byllesby Eng. & Manag. Corp.	88
Carnegie Steel Co.	63
Chillingworth Mfg. Co.	84
Cities Service Co.	28-29
Collier, Inc., Barron G.	21
Consolidated Car Heating Co.	27
Dayton Mechanical Tie Co., The	22-23
Dodge Brothers	Insert 31-38
Electric Railway Improvement Co.	77
Electric Service Supplies Co.	7
Electric Storage Battery Co.	25
Firestone Tire & Rubber Co., The	24
Ford, Bacon & Davis	88
General Electric Co.	16-17-18
General Leather Co.	44
General Steel Castings Co.	82
Globe Ticket Co.	40
Goodrich Rubber Co., The B. F.	54
Goodyear Tire & Rubber Co.	20
Hale-Kilburn Co.	14
Hemingray Glass Co.	86
Hemphill & Wells	88
Heywood-Wakefield Co.	41
Hyatt Roller Bearing Co.	60
Illinois Steel Co.	65
International Register Co., The	87
International Steel Tie Co.	39
Jackson, Walter	88
Johns-Manville Corp.	45
Johnson Fare Box Co.	83
Kelker, Jr., R. F	88
Kuhlman Car Co.	Third Cover
Long Mfg. Co.	59
Lorain Steel Co.	51

Malleable Iron Fittings Co. ... 81
McGraw-Hill Book Co., Inc. ... 79
Mergott Co., The J. E. ... 84
Metal & Thermit Corp. ... 48-49
Mica Insulator Corp. ... 53
Money-Meters, Inc. ... 80

Nachod and U. S. Signal Co. ... 85
National Bearing Metals Corp. ... 79
National Brake Co., Inc. ... 19
National Carbon Co. ... 62
National Pneumatic Co. ... 13
National Tube Co. ... 61
New Jersey Wood Finishing Co., Inc. ... 26
Nichols-Lintern Co. ... 87

Oakite Products, Inc. ... 90
Ohio Brass Co. ... 10-11
Ohmer Fare Register Co. ... 91
Okonite Co., The ... 81
Okonite-Callender Cable Co., The ... 81

Pantasote Co., Inc., The ... 85

Railway Track-work Co. ... 8-9
Railway Utility Co. ... 82
Ramapo Ajax Corp. ... 83
Richey, Albert ... 88
Roebling's Sons Co., John A. ... 80

S. K. F. Industries Inc. ... 70
Safety Car Devices Co. ... 68
Sanderson & Porter ... 88
Searchlight Section ... 89
Standard Oil Co. (Indiana) ... 46
Standard Oil Co. of New York ... 67
Standard Steel Works Co. ... 73
Star Brass Works, The ... 85
Stoody Co. ... 12

Timken-Detroit Axle Co. ... Back Cover
Timken Roller Bearing Co. ... 64
Toledo Pressed Steel Co. ... 80
Tuco Products Corp. ... 82
Twin Coach Corp. ... Front Cover

Union Metal Mfg. Co., The ... 30
Union Switch & Signal Co. ... 87
United States Rubber Co. ... 66
Universal Lubricating Co. ... 71

Wason Mfg. Corp. ... Third Cover
Westinghouse Elec. & Mfg. Co. ... Second Cover 4-5-6
Westinghouse Traction Brake Co. ... 15
Wharton, Jr. & Co., Inc., William ... 83
Wish Service, The P. Edw. ... 88

Searchlight Section—*Classified Advertising*

EQUIPMENT (Used, Etc.)
Central Illinois Public Service Co. ... 89
Crawbuck Co., John D. ... 89
Duie Pyle Contr. Co., A. ... 89
Perry, Buxton, Doane Co., The ... 89
Peoples Rapid Transit Co. ... 89
Schonthal Co., Joseph ... 89
Stirewalt, N. C. ... 89
Zelnicker in St. Louis ... 89

POSITIONS VACANT AND WANTED ... 89



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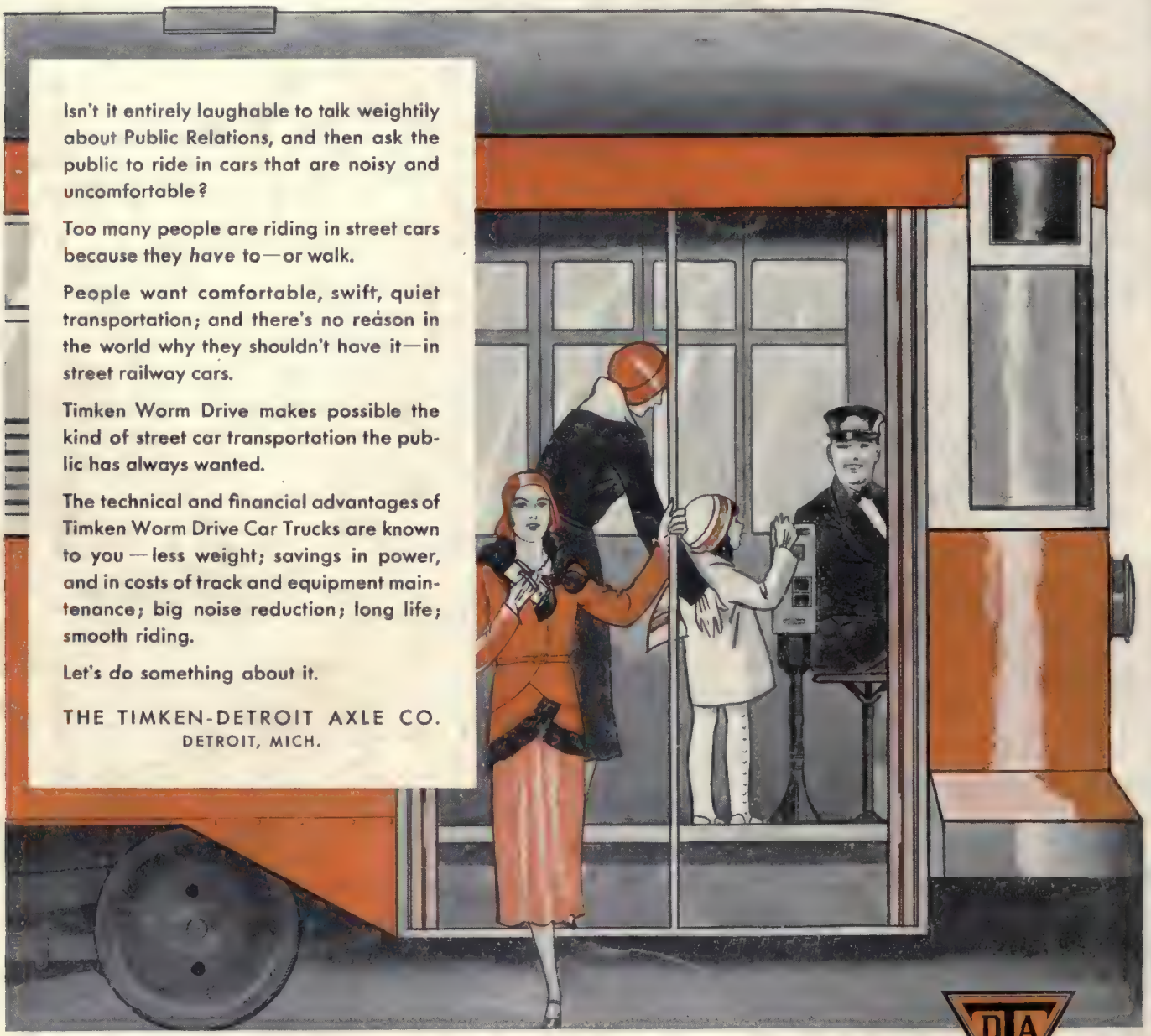
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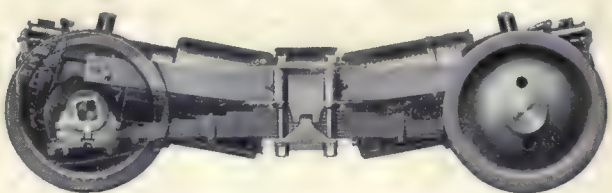
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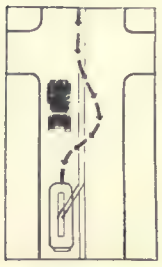
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ALEX MCCALLUM
London, England

LOUIS F. STOLL
Publishing Director

FareEnough

An analysis of several fare changes on a small city property, giving the reasons why they were made and citing the results obtained, will appear in an early issue

Watch For It!

McGraw-Hill Publishing Company, Inc.

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1930

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Contents of This Issue

OCTOBER, 1930

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Editorials 611

Cincinnati & Lake Erie's New De Luxe Cars Challenge the Steam Railroad and the Bus 614

Cost Analyses Indicate Field of the Trolley Bus 622
By W. J. CLARDY

Traffic Improvements Planned for Kansas City 623

Successful Canadian Convention Held at Ottawa 627

Canadian Properties Continue Excellent Record 630

Short Signal Cycles Speed Traffic and Reduce Accidents 631
By J. ROWLAND BIBBINS

Motor Generators Supply Power for Cleveland Terminal Electrification 633

Determining Utility Depreciation on a Logical Basis 637
By JOHN W. BURKE

Trailer Operation Abandoned in Chicago 640

Central Master Mechanics Have Varied Program 641

The Readers' Forum 642

Monthly and Other Financial Reports 643

Journal Maintenance Awards Won by Cleveland Railway 644

Practical Maintenance Ideas Developed by the Cleveland Railway 646

Maintenance Notes:

Connecting Rod Boring Tool—*By L. Rose* 646

Towing and Spacer Bar for Disabled Buses—*By William Piwonka* 647

Brake Lining Selected by Test Results—*By Hoy Stevens* .. 647

Center Control for Temporary Block Signal—*By H. A. Brown* 648

Convenient Machine for Armature Removal—*By Terance Scullin* 648

Dog Holds Armature Pinion—*By M. J. Leary*..... 648

Safety Arm for Coal and Sand Bin Lids—*By Joseph Lapp* 649

Treated Ties Safely Handled—*By R. B. Evans*..... 649

Simplified Boring of Motor Axle Bearing Seats—*By John Greer* 650

Two-Faced Compass Determines Motor Field Polarity—*By R. Dumke* 650

Oversize Bearing Housings Bored in Jig—*By Martin F. Niederst* 650

Ingenious Jig Speeds Brake Head Drilling—*By Martin F. Niederst* 651

Cylinder Boring Device for Air Compressor—*By Ray Sohl* 651

Blinker Light Protects Lineman on Night Work—*By Christ Reinker* 651

New Products for the Railways' Use 652

News of the Industry 655

the NEWEST Current Collector



for the Trolley Bus

PERFORMANCE—reliable and enduring—in collecting current for trolley bus operation distinguishes the new W-812 collector now available for this modern vehicle. Developed by Westinghouse-Nuttall engineers, this collector meets every requirement of this class of service for efficient operation.

Consisting of a welded base, 18-foot pole, polehead and cable, a single W-812 equipment complete weighs only 140 pounds, yet it has abundant strength throughout to withstand the most severe service.

Exactness in the design of the light-weight polehead and the exceptional ease of swivelling obtained by using anti-friction bearings in the harp and base, enable a bus to weave in and out of traffic and make turns with a minimum of dewirements. These features also guard against excessive wear of wheels and wire.

Quiet operation is safeguarded effectively by the manner in which the polehead is attached to the pole and by the remarkable shock-absorbing ability of the all-steel welded base.

Only actual service can demonstrate fully the superior ability of this collector. See your Westinghouse transportation specialist.

Service, prompt and efficient, by a coast-to-coast chain of well-equipped shops

Westinghouse

T 31537

TUNE IN THE WESTINGHOUSE SALUTE OVER THE N. B. C. NATION-WIDE NETWORK EVERY TUESDAY EVENING.

NEW Switchgear

NEW Economies

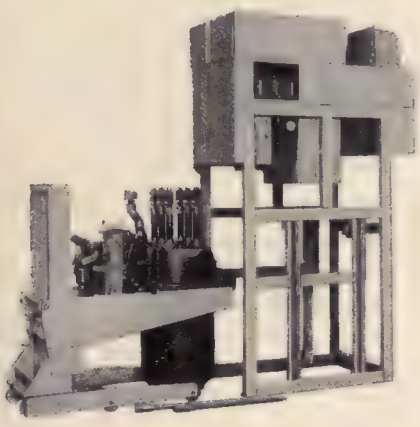


Indoor Cubicle

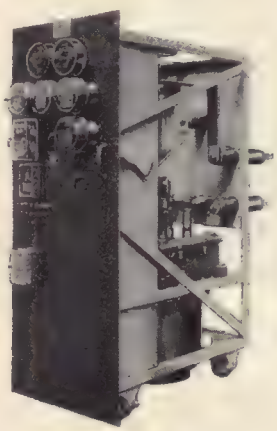
Standardized metal enclosed switchgear units are received practically ready for immediate service. Because of the completeness of assembly, the small amount of erection work necessary can be accomplished in a short time and at the minimum of expense. This reduces the overall installed cost to a figure comparable to that of installations with fewer advantages, that are assembled in the field.

System operating efficiency is increased by the improved reliability and flexibility afforded by metal enclosed switchgear. The fact that metal enclosed switchgear is being used in the majority of new installations, is a *safe buyer's guide* and evidence of its outstanding superiority.

Publications on any of the types pictured will be sent from the nearest Westinghouse office on request.



Metal-clad (Lift Type)



Truck Type



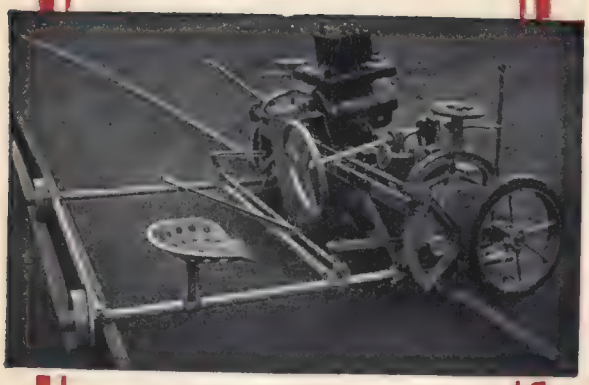
Outdoor Switch House

Service, prompt and efficient, by a coast-to-coast chain of well-equipped shops

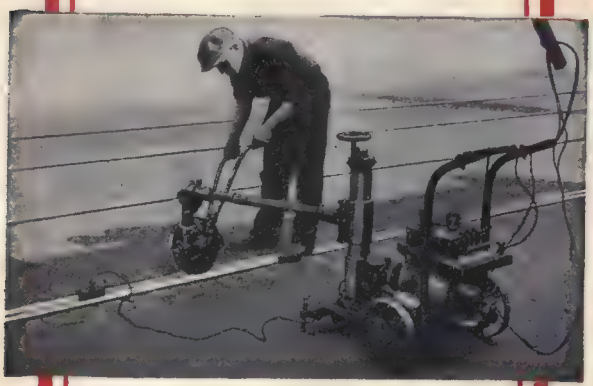
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T 31503

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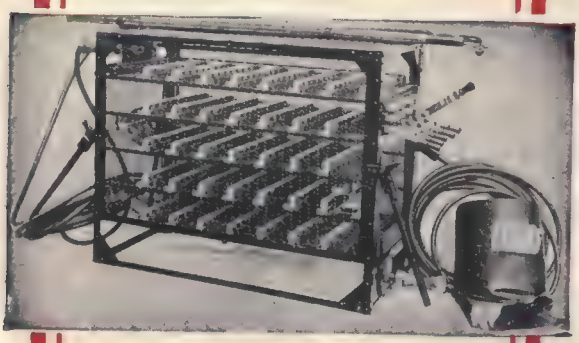
Improved Atlas Rail Grinder



Eureka Radial Rail Grinder



Imperial Track Grinder



Ajax Electric Arc Welder

Old-time roads cannot carry new-day traffic

Yesterday's highways couldn't carry to-day's motor cars, but yesterday's rails can carry to-day's street cars.

It's much easier and cheaper to restore the youth of old rail than to rejuvenate an obsolete highway.

All that's needed is suitable modern equipment—such as the rail grinders and arc welders here displayed for your selection.

Railway Track-work Co.

3132-48 East Thompson Street, Philadelphia

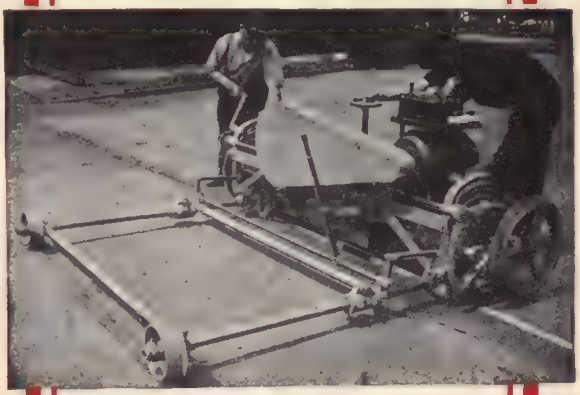
AGENTS

Chester F. Gailor, 50 Church St., New York
Chas. N. Wood Co., Boston
H. F. McDermott, 208 S. LaSalle St., Chicago
F. F. Bodler, San Francisco, Cal.
H. E. Burns Co., Pittsburgh, Pa.
Equipment & Engineering Co., London

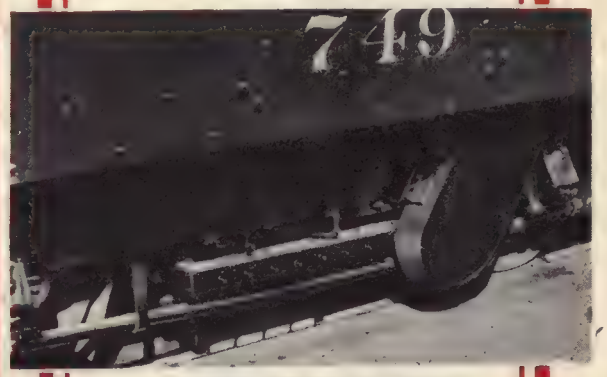
E3571



Reciprocating Track Grinder



Vulcan Rail Grinder



Reciprocating Grinder Car, showing one of the grinding units.



RTW Curve Oiler

A Night Ride on Your Work Car





The Old Type Trolley Ear **The Improved Marathon Ear**

These sections of the ends tell the story. The abrupt approach and leave has given way to the taper.

IF YOU want to find out how smoothly a trolley wheel can pass under the *improved* Marathon Ear—here's how.

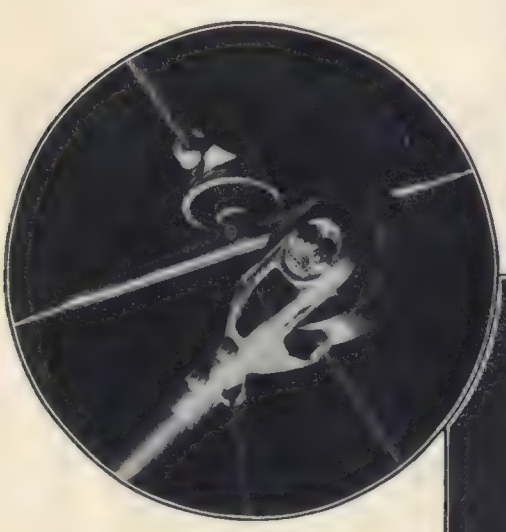
Select any mile-and-a-half section of line on which the trolley ears are in good condition. Remove the ears from the middle half-mile and install improved Marathon Ears in their place. Then, the first moonlight night, get out a work car. Travel over the entire mile-and-a-half stretch, slow, fast, and medium.

Keep your eye on the trolley wheel. Watch it as it passes onto the ears. Does it bump and arc? Watch the leave. Is there a thump as the wheel hops from the ear to the wire? And another arc perhaps?

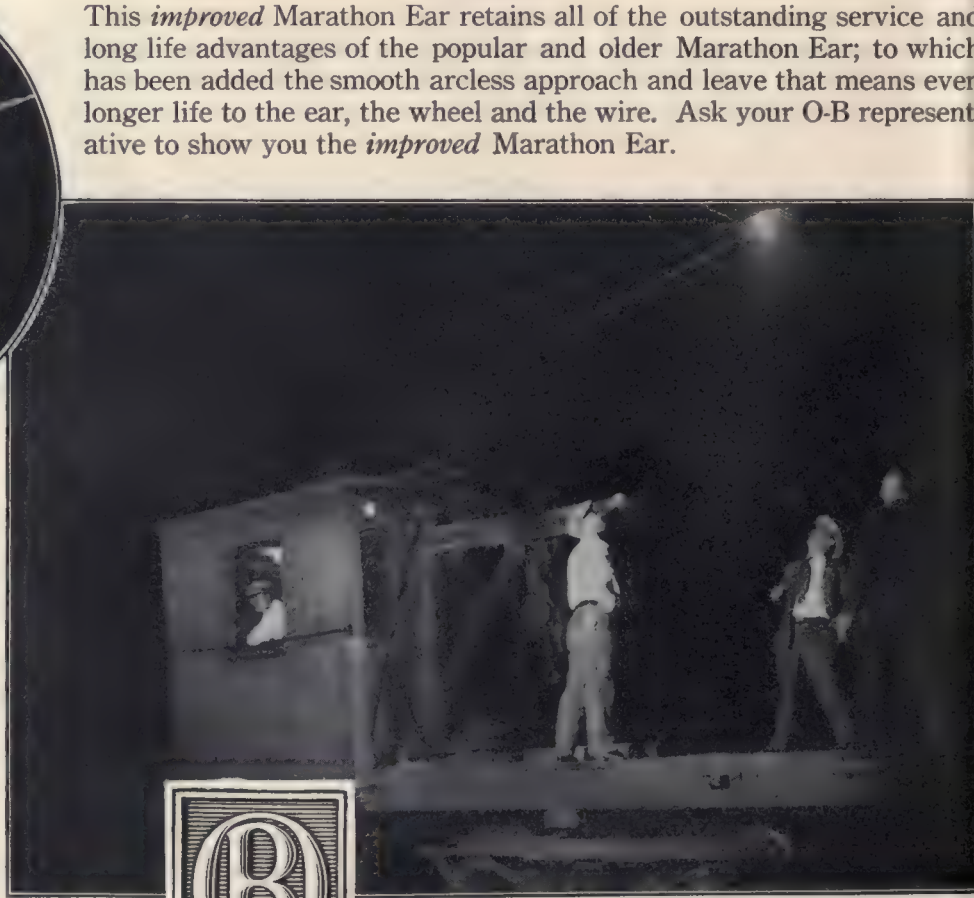
But what's that now? The wheel has quit pounding and arcing. It is now riding the ears more smoothly and easily. Just a quick, smooth surge and the ear vanishes into the darkness. "That's a good job of peening", you say to yourself. But the next ear is the same—and the next and the next.

And now you recognize that you are in the middle of the mile-and-a-half section and that you are passing under *improved* Marathon Ears. It's difficult to tell when you change from wire to ear and back to wire again.

This *improved* Marathon Ear retains all of the outstanding service and long life advantages of the popular and older Marathon Ear; to which has been added the smooth arcless approach and leave that means even longer life to the ear, the wheel and the wire. Ask your O-B representative to show you the *improved* Marathon Ear.



*These illustrations show what you would observe during such a ride. As the trolley wheel passes the old type ears (see right) you will hear a bump as the wheel hits the approach; see an arc as it bounces; hear a thump as it passes from ear to wire and then see another arc. With the new, **improved** Marathon Ears (see above) you will have to be extra attentive even to know that you pass the ear, so silent, so smooth and so firm is the passage.*





These illustrations show the bond testing crew of the Ohio Public Service Company, where a periodical test of rail bonds is made about every three years. This year the test of approximately 6000 bonds showed almost 2% bad from all causes. Several types of O-B bonds are in service on this system, some for periods exceeding ten years. Yet the test showed only a very few damaged in either terminal or strand. O-B Type AW-8 Bonds were used where replacements were needed.



How Long Since Your Rail Bonds Have Been Tested?

EVERY alert operating man knows that an efficient return circuit must be maintained if satisfactory, economical operation is to be secured. Consequently, the recent test made by the Ohio Public Service Company, on its Mansfield and Shelby lines points out the necessity for periodical bond testing. About 2% of the bonds tested proved bad, this test definitely located broken bonds, welds which had loosened from the rails, and bonds which were improperly or not completely welded to the rail.

Even such a small percentage of inefficient bonds frequently cause a great amount of damage to motor equipment; can use an excessive amount of power; as well as cause unnecessary and irritating schedule delays.

Bond testing is not expensive. A two-man crew, with a duplex millivoltmeter, can test from 300 to 350 bonds per day. Even if it is expensive, the cost will be fully justified by the economies possible because of the improvement in the return circuit.

How long is it since you tested rail bonds? If it is more than three years, it is not unlikely that a complete test of your system will reveal defects, which if corrected, will work toward improved operation and greater economy. The fact that 2% went bad in three years on one property may indicate similar conditions elsewhere.

So it is urged that you test your rail bonds regularly, and as a means of securing maximum service from your replacements, select an O-B rail bond of the type you use.

Ohio Brass Company, Mansfield, Ohio
Canadian Ohio Brass Co., Limited
Niagara Falls, Canada
1318BL

NEW PRODUCTS
Supplement No. 4.



Watch for your copy. Mailing to all who now have a copy of O-B Catalog No. 20 is scheduled for completion October 5.

Ohio Brass Co.

NEW YORK PITTSBURGH CHICAGO CLEVELAND ST. LOUIS ATLANTA DALLAS
PHILADELPHIA BOSTON LOS ANGELES SAN FRANCISCO SEATTLE

PORCELAIN INSULATORS
LINE MATERIALS
RAIL BONDS
CAR EQUIPMENT
MINING MATERIALS
VALVES

Of what use are luxurious seats— if passengers

shiver and choke?



The Mueller-Evans Bus-Heating and Ventilating System in a nutshell:

Combining extreme simplicity with perfect heating and ventilating efficiency, this new system is gaining rapid recognition. It is economical. It can be installed by unskilled workmen in a few hours. It provides the same quality of heating and ventilating found in modern office buildings. It has no rotating parts, no electrical connections, and costs nothing to operate!

Write or wire for complete description and prices.

ELECTRIC SERVICE SUPPLIES CO. Manufacturer

RAILWAY, POWER AND INDUSTRIAL ELECTRICAL MATERIAL

Home office and plant at 17th and Cambria Sts., PHILADELPHIA; District Offices at 111 N. Canal St., CHICAGO; 50 Church St., NEW YORK; Bessemer Bldg., Pittsburgh; 88 Broad St., Boston; General Motors Bldg., Detroit; 316 N. Washington Ave., Scranton; Canadian Agents, Lyman Tube and Supply Company, Ltd., Montreal, Toronto, Vancouver, Winnipeg.

A Summary of Features

1. Perfect ventilation based on modern school and public building standards.
2. Temperature of 60° easily maintained in zero weather.
3. Eliminates all gas and other odors.
4. There are no drafts as air is introduced at a temperature close to that of the human body.
5. Cold drafts from window cracks are prevented as the air current is reversed.
6. Aisleways are kept drier.
7. Uniform temperature throughout the vehicle.
8. Easy control of heat supply.
9. Absolute elimination of gas hazard and fire hazard.
10. Windows kept free of frost.
11. Drivers are less subject to fatigue under healthful working conditions.
12. Simple to install.
13. Low cost and *no cost to operate.*
14. Definite saving in gasoline by reason of normal motor operating temperature.
15. Occupies no salable space in the vehicle.
16. No rotating parts to wear out.
17. Accessible and quickly removable.
18. Interferes in no way with motor operation.
19. No pipes or joints to corrode or leak.
20. The system is compact and under easy observation of the mechanic.
21. Warm, odorless buses have a decided revenue producing value.

REBUILDING YOUR MANGANESE SPECIAL TRACK WORK WITH

STOODY
MANGANESE WELDING ROD

Will Greatly Increase Your Net Revenue



By lengthening the useful life of your manganese steel special track work through the adoption of welding them back to shape with STOODY MANGANESE WELDING ROD and thus eliminating the necessity for frequent replacements, your annual maintenance expenditure will be considerably decreased. Decreased maintenance expenditures makes possible increased net revenue; oftentimes, it converts a loss into a profit.

If you are not thoroughly familiar with STOODY MANGANESE WELDING ROD and its successful performances write for a list of its accomplishments.

STOODY COMPANY

Manufacturers of

Welding Rod ◆ Alloy Steels ◆ Equipment

WHITTIER, CALIFORNIA

AND EASY LIES THE HEAD ····



CERTAINLY the fact that comfort pays has been well proven by the Cincinnati & Lake Erie Railroad Company. In twenty new cars recently delivered by The Cincinnati Car Corporation, Hale & Kilburn No. 900-D double chairs were installed throughout, except for portable chairs in the lounge compartments of the ten limited cars.

A notable feature of this deeply upholstered luxury seating is the special pillow headrest on each chair, providing support for each passenger's neck and head. Because of it, the traveler enjoys an extremely comfortable ride.

There is a noticeably improved tone to electric railway transportation and much of it due to a thoughtful regard for passenger comfort as expressed by definite specification of these luxurious Hale & Kilburn chairs.

HALE & KILBURN SEATS

HALE & KILBURN CO.

General Offices and Works: 1800 Lehigh Ave., Philadelphia

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Hale & Kilburn Co., McCormick Bldg., Chicago
E. A. Thornwell, Candler Bldg., Atlanta
Frank F. Bodler, 903 Monadnock Bldg., San Francisco
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H. M. Euler, 53 First St., Portland, Oregon



COMMUNITY TRACTION

(A winner of the 1930 Maintenance Award)

buys 4 more Mack Buses

Community Traction Company, Toledo, Ohio, know what Mack performance means in reducing maintenance costs.

In 1926 the Company purchased its first six buses — MACKS. Those MACKS have averaged a total of seven hundred and fifty thousand miles.

And now, due to the dependability and low operating and maintenance cost of these MACKS, the Community Traction Company has just bought 4 NEW 29-passenger City Type, Model BC six-cylinder MACKS.

Facts more convincing than claims show that MACK dependability, passenger satisfaction, economy and long life are steadily advancing bus operating standards

Mack

for

low maintenance

MACK TRUCKS, Inc.

25 Broadway, New York, N.Y.

SPEED UP YOUR BRAKES with RELAY VALVES



This Relay Valve, interposed between the brake valve and brake cylinder, functions to open a direct communication from the reservoir to the cylinder, and from the cylinder to atmosphere. The rapid build-up of pressure thus effected helps to shorten the stop, while quick exhaust of air reduces standing time of a car by permitting a quicker get-away. The fast application—of one second or less—is due to the large capacity of the Relay Valve, its close location to the brake cylinder, and to the small volume between it and the brake valve—reduced to a minimum by the use of copper tubing.

Speedy brake action is needed to meet present-day demands of street railway service—quick stops must be made if cars are to keep pace with other vehicles in the traffic stream. Faster build up of brake cylinder pressure will help to shorten stopping distance, and every second saved in this direction is of value ... The most effective means yet devised for speeding up brake action is a Relay Valve, the object of which is to reduce the volume of air that is directly controlled by the brake valve during application and release operations. — — —

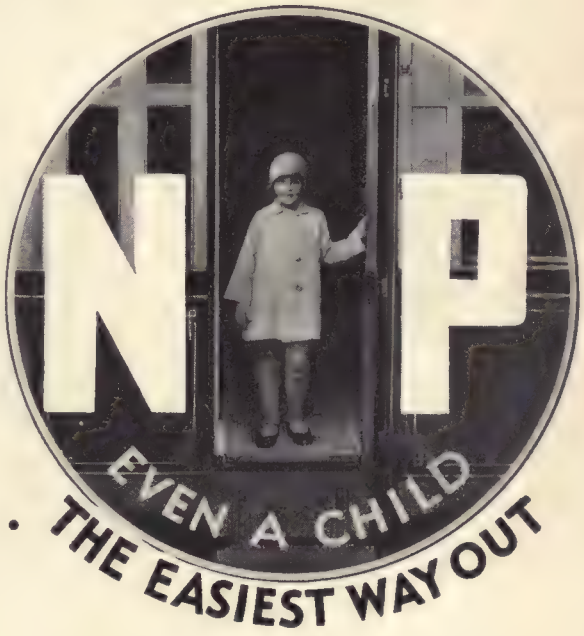
WESTINGHOUSE TRACTION BRAKE CO.

General Office and Works, WILMERDING, PA.



Baltimore's 150 *New Cars* are equipped with N. P. Door Control

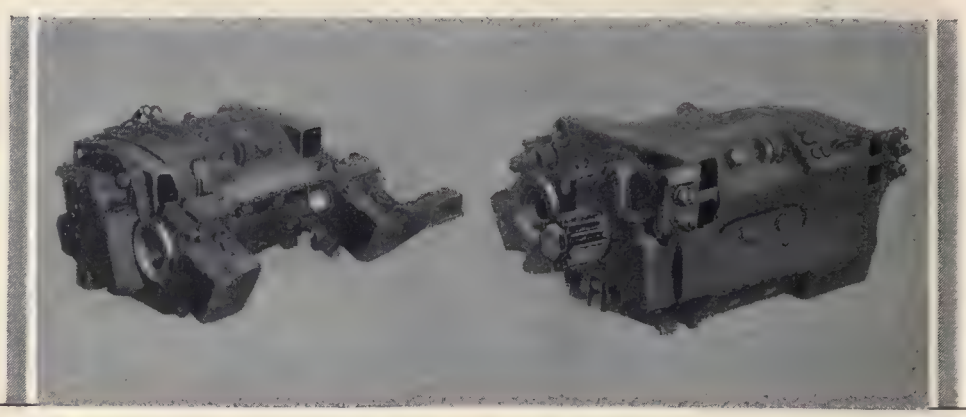
To furnish Baltimore with the best possible service, the United Railways and Electric Co. recently ordered 150 new cars of the most modern design. Of course, these cars are completely equipped with N. P. Door Control, including the N. P. Automatic Treadles that speed up service by providing . . . . .



NATIONAL PNEUMATIC CO.

FOR THE FAST, SMOOTH trolley buses

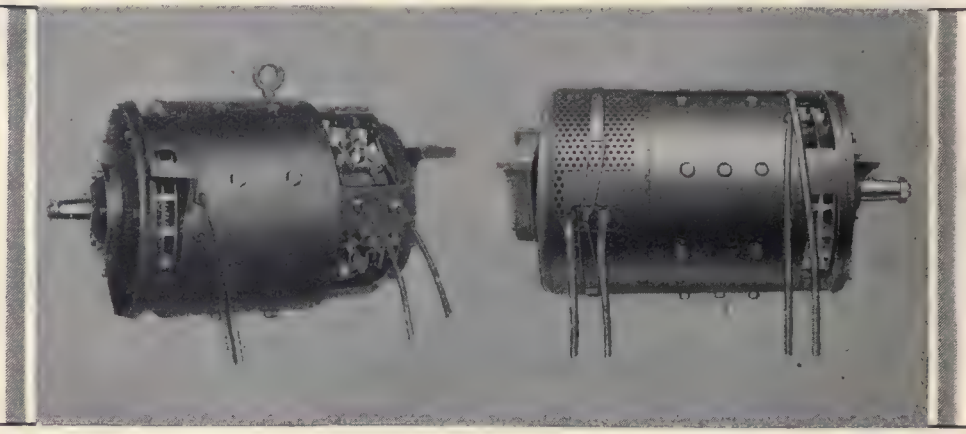




GE-702, 35-horsepower motor for trolley cars

GE-301, 50-horsepower motor for trolley cars

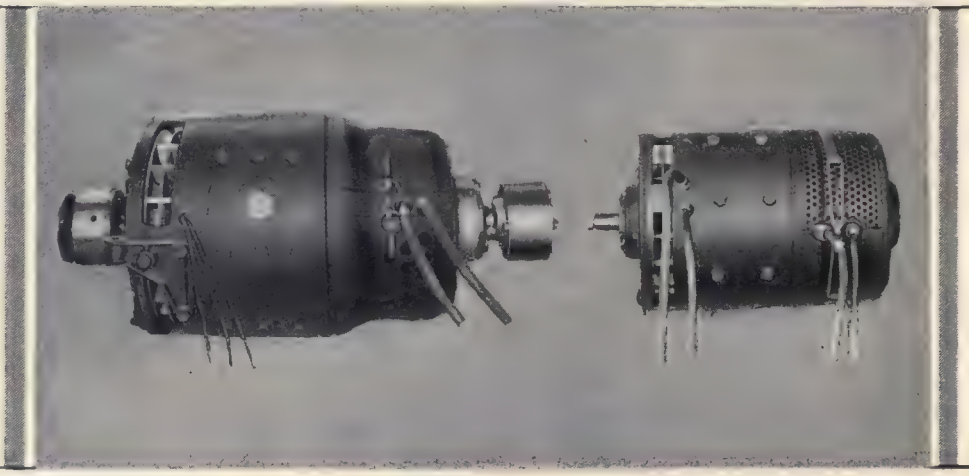




GE-1126, 35-horsepower motor for trolley buses

GE-1154, 50-horsepower motor for trolley buses





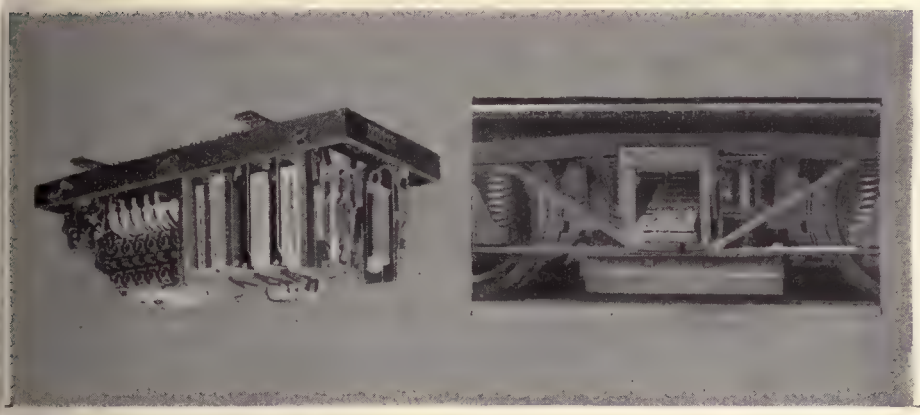
Type DT-1121 generator for gas-electric buses

Type GE-1151 motor for gas-electric buses

GENERAL

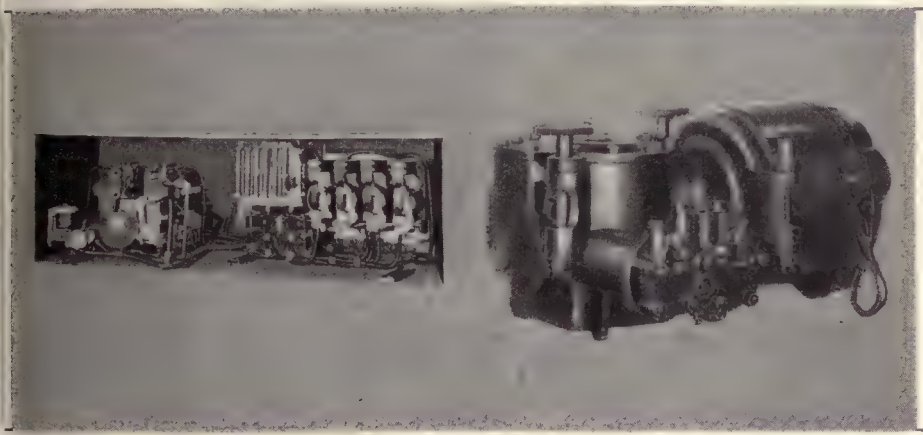
GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y.

ACCELERATION of trolley cars, and gas-electric buses



PCM 18-point control for trolley cars

G-E magnetic track brake for trolley cars



PCM 18-point control for trolley buses

Type CP-25 compressor for trolley buses

IN meeting the demand for fast acceleration, General Electric engineers have developed new motors, new control, and new braking equipment. (Fast acceleration should always be balanced with good braking.) This modern General Electric equipment makes possible high schedule speeds with comfort and safety and attracts patronage. The many improved features of design are certain to result in substantial operating economies when the equipment appropriate to your service conditions is applied. With General Electric equipment, the modern light-weight car, the trolley bus, and the gas-electric bus are meeting every requirement of the railway industry. Ask your nearest G-E office for complete information.

Join us in the General Electric program, broadcast every Saturday evening on a nation-wide N.B.C. network

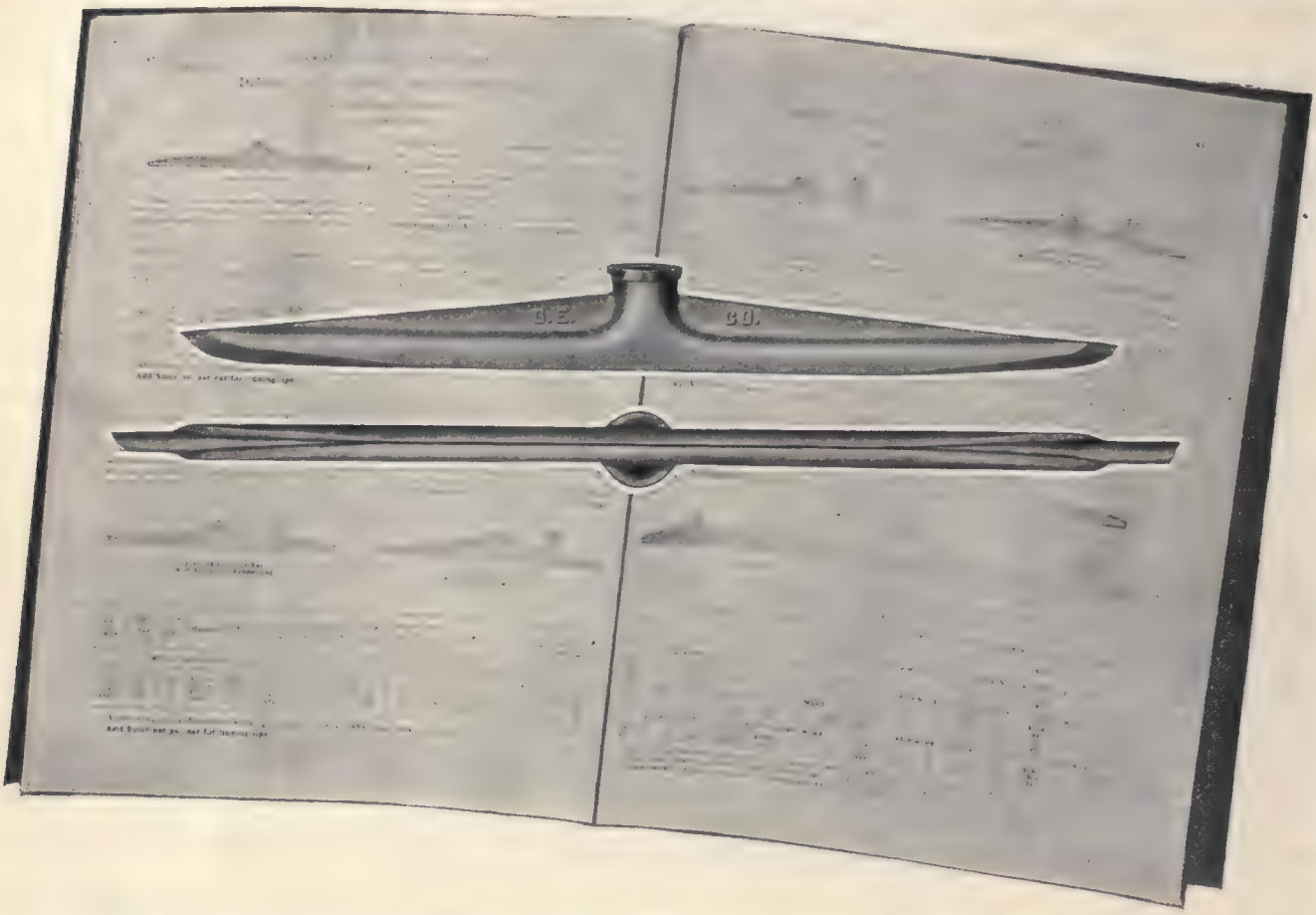
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ELECTRIC

SALES AND ENGINEERING SERVICE IN PRINCIPAL CITIES

G-E LINE MATERIAL HOLDS IN THE HARDEST SERVICE

FORM C2 EARS



CONSIDER Form C2 ears. In them, you are certain of good design, high-quality materials, and faultless workmanship. Then too, Form C2 ears, like all other G-E line material, are carried in stock by the many G-E line-material dealers throughout the United States. This material is easy to obtain, easy to install, and hard to wear out. Let us send you our new catalog, GEA-611, which describes all G-E line-material devices. Address the nearest G-E office or General Electric Company, Schenectady, N. Y.

JOIN US IN THE GENERAL ELECTRIC PROGRAM, BROADCAST EVERY SATURDAY EVENING ON A NATION-WIDE N.B.C. NETWORK

370-25

GENERAL ELECTRIC

SALES AND ENGINEERING SERVICE IN PRINCIPAL CITIES

Electric Railway Journal

Consolidation of
Street Railway Journal and Electric Railway Review
A McGraw-Hill Publication—Established 1884

JOHN A. MILLER, JR., Editor

Volume 74 | New York, October, 1930 | Number 11

Conditions Favorable Now for Modernization

TO UNDERTAKE extensive plant improvement at a time like the present, when business conditions are considerably below normal, might at first appear to be the application of a counsel of perfection, but actually there are excellent reasons for so doing. The general feeling existing among business men that expenditures of all kinds should be curtailed until conditions improve, appears to be founded upon vague apprehension rather than definite facts. In many respects the immediate future presents an unusually promising opportunity for modernizing equipment and machinery.

For some time past the barometer of business has stood without much change at about 85 per cent of normal. This closely approximates the minimum figure recorded during the 1921 depression. Past experience indicates that stiff resistance begins to be felt at about this point, and it appears improbable that any further serious decline will now occur, although a definite upward movement may not set in immediately.

PRICES are now the lowest in years. Economists who have studied the matter state that they are not likely to go lower. On account of its feeling of apprehension, business has not been borrowing extensively and idle money has been accumulating. This has resulted in the creation of a favorable credit situation which makes the forward buying of raw materials at this time a thoroughly sound policy. There are signs that shrewd management in many lines has already begun to buy. Stocks of commodities and raw materials have been allowed to run extremely low. If buying becomes general the situation may change with the suddenness of the bursting of an ice jam and a lively scramble for materials may ensue.

Not only is the present a favorable time for buying ordinary materials and supplies, but it is also a particularly opportune time to undertake modernization of plant and equipment. This is no less true for the electric railways than for other industries. The future undoubtedly will make exacting demands upon the transportation companies as to quantity and quality of service. Any idea that standards of living will be permanently lower and that former automobile users will be compelled to patronize the public transportation service is likely to prove an illusion. The history of business depressions in the past shows that standards of living are not permanently affected. Electric railways cannot afford to postpone improving their equipment in the hope that the public will remain satisfied with what they now have. The railways must continue to improve their product to keep pace with public demand.

ANOTHER factor of supreme importance is the economic advantage of modernization of plant and equipment. It has been demonstrated again and again that new rolling stock can be made to pay for itself out of the larger earnings and the operating savings. This is equally true of other improvements. Shop costs can be substantially lowered by the introduction of up-to-date machinery. Track and line maintenance costs can be reduced through modernization.

Under existing conditions the financing of improvements should not present any very serious problems. The electric railways have been less affected than any other industries by the present business depression. Credit is comparatively easy. The bankers will scarcely remain deaf when it appears that the work to be carried out will be quickly paid for by the resultant savings. A dollar spent today for modernization will buy substantially more that it has for some time past, and more than it is likely to do in the future.

Timidity a Bar to Progress in Car Design

EXPERIMENTAL designs of cars incorporating radical innovations have been comparatively numerous during the past few years. These developments have been received by the industry with lively interest. But only in a few instances have railways actually bought such cars and tried them out on an extended scale. When purchases have been made it has been customary to order cars designed very much along traditional lines.

In defense of this policy it is contended that the new developments have not yet been proved out in service and that their adoption on a large scale would involve grave risks. There is some truth in this contention, but it should be remembered that there is also a certain amount of risk in not buying equipment of the latest design. New cars bought today but built along the same general lines as the cars of a decade ago, may be rendered obsolete almost at the outset if the latest designs prove successful.

The fear that equipment of new design will not stand up in service has been exaggerated beyond all reason in the electric railway industry. No such apprehension exists in other fields. When Henry Ford brought out his new model automobile a few years ago, prospective purchasers did not question its practicability and continue to buy the old Model T. They bought the new machines as fast as the factory could produce them.

The latest types of electric railway equipment are the outgrowth of painstaking scientific study. That they will give faultless service is too much to expect. On the other hand, there is no reason to anticipate that they will prove less satisfactory than the older types. In fact, there is every reason to expect that they will prove more satisfactory. So long as the railways refuse to adopt these new designs and cling tenaciously to the designs of a decade or more ago, they must expect to have their equipment appear obsolete.

Neglect of Precautions Against Fire May Prove Costly

INDUSTRY pays the cost of fire insurance. From that fundamental principle there is no escape. This means that a favorable record maintained over a period of years will make possible lower rates; conversely, a succession of disastrous losses will just as surely produce higher rates.

As a result of the improved record of the electric railways of the country for some years past, the insurance committee of the American Electric Railway Association, through co-operation with representatives of the stock fire insurance companies, was able in 1929 to secure a substantial reduction in the cost of insurance to the industry, resulting in an aggregate saving of many thousands of dollars in insurance premiums. Within the past year, however, there has been a change in the trend. Carhouse fires resulting in losses in excess of a million and a quarter dollars have been reported.

Investigation into the causes of some of these recent fires would suggest that adequate precautions have not been taken. In one instance, where a large loss was sustained, there was a delay of fifteen minutes between the discovery of the blaze and the turning in of the alarm. The employee who discovered the fire ran past one alarm box, the location of which should have been familiar to him, to another box located a quarter of a mile away. The presence of dry grass in car storage yards has been responsible for a number of dangerous blazes. Certainly this would appear to be an inexcusable neglect of ordinary precautions. On one particular property more than 40 fires occurred in the switch groups of cars in service. Lax inspection seems to be the only possible explanation of this situation.

If, in a spirit of economy, there had been a tendency to reduce expenditures for fire prevention below a safe margin, it is much to be regretted. In the long run it will certainly prove to be very poor economy. While the routine of fire prevention is not a particularly inspiring job for those who carry out its details, it is a most important one. If it is neglected, the entire industry will pay heavily.

Investment by Compulsion

UNREASONABLE in the extreme is the attitude of some municipal authorities in requiring the electric railways to make non-productive investments. An excellent example of this is furnished by the experience of an electric railway company which owned a combination railway-highway toll bridge. In response to a widespread popular demand that this be made a free bridge, the company presented it without charge to the municipality, stipulating only that its cars should always have free use of the bridge. But the number of automobiles using this bridge increased rapidly, and the municipality soon decided that the old bridge should be replaced by a larger and more pretentious structure. This was done at no inconsiderable expense and the railway was presented with a bill for something more than $100,000 as its share of the cost of building a bridge which served its purposes no better than the bridge which it had once owned and given away.

Not altogether unlike this, is the situation in another city where it is proposed to create an impressive plaza adjacent to a handsome new steam railroad passenger station. Numerous street changes are contemplated in this project. Near by is a power house owned by the local electric railway, and under the streets are many cables running to outlying substations. Relocation of conduits and cables will probably cost nearly $100,000. Does the city expect to pay the cost of this phase of its civic improvement program? Certainly not—the brunt of the cost is to be borne by the company, which is perfectly satisfied with the present location of its conduits and cables.

Another similar instance is found in a plan for extending the municipal park system in a certain city, involving the relocation of street railway tracks at an estimated cost of about $500,000 to the company. In return for this the railway gets exactly nothing—no more passengers, no more revenue, no reduction in operating expense.

Now, it so happens that in the cities where these companies operate there is great hue and cry about the high cost of street railway service. Officials of the local government are loud in their assertions that the companies' figures of capital invested are far too high—that these investments do not truly represent property "used and useful in the public service." These officials are ardent advocates of the prudent investment theory of valuation. But they are strangely silent about the prudence of a railway making an investment of $100,000 in a new bridge for private autos, or a similar sum in

new cables and conduit to permit the creation of an impressive plaza at the gateway to the city, or $500,000 in track changes necessitated by the extension of the municipal park system. Such expenditures, into which the railways are forced without hope of ever getting back one single penny in return, would be severely criticized if they were done voluntarily. Because they are done under compulsion does not make the expenditure any more justifiable. It merely shifts the blame to the municipal authorities.

Seattle's Ever-Present Problem

TURMOIL and trouble have been the lot of the city of Seattle ever since it took over the railway lines of the Puget Sound Power & Light Company shortly after the war. The prediction was made at the time that difficulties would ensue, but there was no stopping the politicians then in the saddle. They have now passed into oblivion, but what a heritage they have left to their successors! At Seattle mayors have come and mayors have gone, as have councilmen, too, while the Seattle Municipal Railway has proceeded from bad to worse, physically and financially. In the post-war period, the privately owned railway systems have certainly had their troubles, but no patient on the sick list suffering from complications incident to recent economic changes is nearer financial death than the Seattle Municipal Railway.

Ole Hanson, Seattle's Mayor who put the city into the railway business, is merely a memory. But municipal ownership in that city is more than a memory. It is a very unpleasant reality. To review all the details is not necessary. Although a moratorium on the principal of the debt has been arranged for a period of two years to give the municipal railway a breathing spell, the situation is so bad that resort has again been had to warrants payable in the future to provide cash to meet the current interest charges. In effect, Seattle has been robbing Peter to pay Paul. The city has at times borrowed from the light fund to meet railway obligations. It has been constantly living out of capital. It has gone from one unhappy expedient to another. Each has failed except as a temporary measure. Even the grandiose plan went askew involving the marketing of $10,000,000 of general city obligation bonds, $9,000,000 to be applied to the liquidation of original purchase price and the rest to go for improvements. The present mayor was right in saying that "a straight out-and-out railway bond issue would not be attractive to investors under present conditions in Seattle." Thus, as one commentator has said, Seattle's experiment in running its railway seems to be entering its last disastrous phase.

Of course, high-grade managerial talent might help the situation, but men of real capacity are few and far between who would risk their reputations under the system that endures in Seattle. What is the answer? Seattle got nowhere on a 5-cent fare. It has got nowhere on a 10-cent cash fare with three tickets for 25 cents. The existing situation presents an economic problem of the first magnitude. As such it must be solved. Politics has not found the answer in the past fifteen years. Will the committee of citizens now charged with the work of planning a remedy have the gumption to suggest the one answer that might contain a ray of hope —to divorce the operation of the system from politics? That would be a strange anomaly—municipalization without politics.

Dropping the Trailer

CONSIDERED to be an economical means of increasing passenger carrying capacity on heavy traffic routes, the operation of multiple-unit and trailer trains enjoyed marked popularity during the first half of the past decade. As congestion on the streets became worse and peak loads became heavier, more and more trailers were pressed into service. Almost every large city railway used trailers, some on an extensive scale. But conditions have changed during the past few years, and a number of companies are reverting to single car operation. The move made recently by the Chicago Surface Lines in abandoning all of its trailer operation is particularly significant. Shortly after this came news that the Cleveland Railway, another large user of trailers, was suspending their operation on the Lorain Avenue line to study the results with single units.

In both cities the trailers were dropped so that more frequent service could be given and faster schedules maintained. Since speed and frequency are important factors in encouraging the public to patronize street cars, the companies feel that this move should result in increased riding. Use of single units may actually decrease the cost of operation, and if riding is stimulated the additional gross income and net income may be quite pleasing.

Speaking generally, trains operated in city service have been of three types: (1) motor car and unmotorized trailer; (2) motor car, and trailer with motors but without control; (3) multiple-unit cars. In most cities the practice has been to operate the motor car as a single unit in the slack hours and pick up the trailer for the rush. This has the advantage of increased rush-hour carrying capacity without a corresponding increase in platform labor. On the other hand, picking up and dropping trailers is a cumbersome job unless special facilities are provided. Moreover, to haul a trailer at the desired speed, the motor car must be equipped with large capacity motors making it overpowered for operation as a single unit.

Permanently coupled trains have been used to some extent, and recently a considerable number of articulated units have been placed in service. But operation of these large units throughout the day can be justified only on lines where riding is exceptionally heavy. A serious disadvantage of all types of train operation is that it is ordinarily slower than single-car operation because of the greater number of stops which each unit must make.

Weighing the cost of operation against the resulting patronage is the only way to determine which type of service is the most satisfactory. Analyses of this kind seem to indicate that on some properties train operation is more satisfactory than single units. On other properties it appears that single units are the better choice. In Chicago, the frequency of service was doubled and the running time reduced 12 per cent on Madison Street when trailer operation was abandoned. These are important improvements, and their effect in making the service attractive deserves serious consideration. Similar improvements are anticipated as a result of the change in Cleveland. Whether or not the theory on which these companies are working has a wider application is difficult to foretell. Certainly, the comparative results of single units and trailer operation in both Chicago and Cleveland will be observed with keen interest by the entire electric railway industry.



One of the new cars. Note the low height, tapered ends and curved roof specially designed for high speed operation

Cincinnati & Lake Erie's

NEW DE LUXE CARS

Challenge the Steam

WHAT is perhaps the most interesting and significant experiment of recent years in the development of interurban passenger traffic appears to be a pronounced success. This experiment, which has been tried on the lines of the Cincinnati & Lake Erie Railroad in Ohio, seems to point the way for the upbuilding of the passenger business of many interurban properties whose physical characteristics are such that sustained high speeds can safely and comfortably be made.

Early in 1929 the management of this interurban, under the leadership of its president, Dr. Thomas Conway, Jr., began a series of experiments designed to point the way to the evolution of an interurban car much faster and more comfortable than any which had theretofore been built. To this end the company adapted some of its low-level trucks to permit of unusually high speed and mounted them under car bodies generally similar in appearance and size to those which the management had in mind. These experiments were conducted in conjunction with the Westinghouse Electric & Manufacturing Company, the General Electric Company, the J. G. Brill Company, the Cincinnati Car Corporation, and the Westinghouse Traction Brake Company. Many valuable lessons were learned; many baffling problems were encountered and, one by one, they were solved. Specifications embodying these developments were thus gradually built up under the active supervision and direction of W. L. Butler, executive vice-president of the railway, who, more than any other man, is responsible for this unusual contribution to the car builders' art.

In these experiments certain premises of the management were clearly established:

1. That it was possible to build a car of aluminum and steel which, while light in weight, would possess the necessary staunchness and rigidity for sustained speeds on level tangent track in excess of 75 m.p.h. and also have satisfactory riding qualities.
2. That it was possible to obtain these results with a low-level truck, using 28-in. wheels, provided the adaptations and changes worked out during these experiments were made in the truck design to withstand the extreme stresses and to absorb and cushion the magnified road shocks, side sway and other forces incident to such high speeds.
3. That, all things being equal, a car of the low-level type would ride much better at high speeds than the conventional interurban car.
4. That the attainment of such speeds was conditioned upon the evolution of motors which would meet the truck clearance limits and possess the power necessary.
5. That with such high speeds one of the most serious problems was braking, and that methods of braking additional to air brakes must be employed. The new cars are equipped with both air and magnetic brakes, interconnected so that the latter come into use only after the air-brake application approaches the safe limits of wheel friction.
6. That to attain great speed the lines of the car itself were important. The roof must be as low as possible consistent



Luxurious fittings are used in the observation-lounge compartment



An unobstructed view is obtained from the rear of the observation compartment



Comfortable seats are used in the coach, and the entire front end of the car has been opened up so that passengers may look ahead



Revolutionary and luxurious equipment attaining speeds in excess of 80 miles per hour permits a brand-new type of long-distance passenger service. Rapid increase of business is being made without undermining existing traffic

Railroad and the Bus

with proper ventilation and interior appearance, and the lines of the car such that it would not tend to "float" at high speeds. The car should be streamlined, and the roof lines should be so designed as to increase the traction at high speed.

Clear Vision Front Deemed Essential

From interviews by the company's traffic supervisors and checkers with hundreds of passengers, both on its own rail and bus lines and those of competitive steam railroads and interstate bus lines, the management became convinced that one of the major objections of the traveling public to the interurban car in favor of the bus was that the bus passenger's view was unobstructed; he could see where he was going and enjoy the scenery in front as well as on either side. This greatly increased his interest and enhanced the attractiveness of the journey. While it was recognized that electric railway operators were reluctant to have the front ends of their cars "opened up" because of the danger of flying glass in collisions, the management determined to adopt the characteristics of the bus and of the limousine and by placing shatter-proof glass in all front and rear sash of the car, reduce or eliminate this hazard. Moreover a metal bulkhead with shatter-proof glass between the front corner posts of the car at the rear of the platform, forms, as it were, a second line of defense to the passengers in the event of a collision.

Interesting and serious construction problems were presented in thus opening up the front of an interurban car designed to operate at unusually high speeds. Unusual aerostatic pressure would be encountered. The problem of making a car airtight in severe weather must be solved. Because the rear was to be arranged like a steam railroad observation car, it was necessary that all passengers should enter and leave, except in emergency, through the front door. With the future possibility of operating in the Cincinnati subway, it was decided, rather than to have the door extend to the bottom of the lower step, to use a short door and a hatch, mechanically operated and weather and wind proof.

The primary problem was the development of motors within the clearance limits with power to attain the desired free running speed of at least 75 m.p.h. After prolonged negotiations, both General Electric and Westinghouse contracted to construct such motors.

One-half of C. & L. E.'s new interurban cars are the de luxe observation-lounge type; the remainder are coaches. In neither is provision made to carry dispatch freight or trunks—the management being convinced that passengers will not tolerate delays to load merchandise or heavy baggage. Trunks and dispatch freight are handled on certain local runs at times of light traffic, where the type of car purchased in 1927 is operated. In their general features the new coach and the de luxe car are

Table I—General Specifications and Dimensions, Cincinnati & Lake Erie Cars

Length over all	43 ft. 9 in.
Length over body posts	33 ft. 10 in.
Truck wheelbase	6 ft. 2 in.
Bolster centers	23 ft. 2 in.
Width over all	8 ft. 9¾ in.
Height, rail to trolley base	11 ft. 4 in.
Height, rail to car floor	39 in.
Body	Steel and aluminum
Heat insulating material	Compressed cork
Interior trim	Aluminum, finished in imitation of walnut and old ivory
Motors	Ten cars-General Electric No. GE706-A Ten cars-Westinghouse No. 539-A
Trucks	ABC—74 D (Cincinnati Car Corporation)
Wheels	Rolled steel, 28 in. diameter

Weights:

	De Luxe Type; Westinghouse Equipment	Coach Type; General Electric Equipment
Trucks	12,300 lb.	12,300 lb.
Brakes—Air 2,900 Magnetic 1,300	4,200	4,200
Car body, with toilet room equipment	13,200	13,200
Seats	2,400	2,400
Other accessories	1,100	1,100
Sub-total	33,200 lb.	33,200 lb.
Motor and control equipment	14,600	15,100
Totals	47,800 lb.	48,300 lb.

identical except that the space set apart as an observation-lounge in the de luxe type is fitted with transverse seats in the coaches and no luggage compartment is provided in the coach, a small space being reserved for this purpose behind the rear seats.

The railway has had in force about a year a successful profit and savings sharing plan by which its employees participate in the fruits of economies and increased profits. When the time came to formulate definite plans for the operation of the new equipment and the inauguration of the new long-distance high-speed service, President Conway submitted to the trainmen a proposal that all passenger service on the Columbus and Toledo divisions should be operated by one man and that all de luxe service on the system should be so operated. After thorough consideration the men voted to adopt the plan. One-man operation of this service has been entirely successful; both men and management are enthusiastic concerning it. An interesting feature was that, through the introduction of the blue ribbon long-distance service, enough additional car-hours were run to provide employment for all trainmen. Thus it has been possible to give a largely augmented service with a relatively low increase in operating expenses.

The salient features of the specifications of the new cars are summarized in Table I.

The first impression gained is that the car is very low. Its riding qualities, unusual even in a car for ordinary speeds, are due to its low center of gravity, made possible by the use of a low-level type of truck, the absence of high bolsters and the low roof. The taper of the ends to cut down wind resistance is clearly apparent, as is also an adherence to recent notable tendencies in automobile design such as high body sides, or a relatively high window sill. By thus bringing up the window ledge the problem of keeping the car comfortable at high speeds in severe winter weather is minimized. Drafts when the windows are raised in the summer also are reduced. It is, moreover, possible to raise the window sash sufficiently to avoid interference with vision. The relatively high side sheathing and wide letterboards give the car an appearance of solidity and permit a maximum of diagonal and lateral bracing. Concealed lights on the front dash, standard on earlier C.&L.E. equipment, were retained, as were the lamps at the four corners of the car, which the company has found greatly decreases automobile collisions in city streets. Space is provided on the front dash to carry signs for company advertising. Because of the speeds attained, a special locking device had to be devised to prevent these signs from being blown off. A double Hunter illuminated sign shows the destination of the train in white and its name in red letters, a black background being used for both. Attractive train emblems, similar to those on the crack steam railroad trains, are carried on the rear of all de luxe cars. The names of these trains were selected from some 1,211 submitted by employees and their families in a cash prize contest inaugurated by the company. The art work in connection with the train emblems was executed by the Geyer Company, advertising agent of the railway. Upon the inaugural trip of each of these trains, the respective prize winners and their families were the guests of the management. This tangible recognition of the part which the employees played was featured in the local newspapers as a "human interest" story.

Of the 38 lineal feet inside the car, exclusive of the



The latest Pullman fixtures are installed in the toilet



Fare collection is made easy by use of a special cash register



Luggage compartments are an appreciated feature of the de luxe cars

toilet and luggage compartment, 14 ft., or approximately 37 per cent, are contained in an observation-lounge section in the rear. This section is furnished attractively with large, comfortable lounge chairs and couches upholstered in mohair and small reading tables, carrying attractive reading lamps, spaced at convenient intervals. A Wilton carpet covers the floor. The forward section of the car is equipped as a coach.

In the design of seats for these coaches, the plan originally worked out by the Conway interests for the Chicago, Aurora & Elgin was adhered to. Care was taken to make sure that the seats were low enough to be comfortable for the short-legged passenger. Seat centers were spaced at 33 in. to give plenty of leg room. After much experimentation the proper construction of seat cushions and back cushions was determined to give comfort without excessive springiness, tending to intensify road vibrations. A type of headroll was chosen which would invite relaxation but not be so bulky as to strike the hat. The seats are finished in genuine green leather. They are 39½ in. wide and designed to "fit the back."

Believing that the operator should be as comfortable as the passenger, equal care was given to the design of his seat. Sample seats embodying varying characteristics were constructed by the Hale & Kilburn Company and shipped to the plant of the Cincinnati Car Corporation, which received the contract for the construction of the cars in accordance with the plans and specifications of the company. These seats were set up in a dummy front end, or platform, in which was located the controller, air-brake valves and other apparatus to be placed on the operating board of the car. The trainmen's cooperative committee then journeyed to Cincinatti, and after explanation of the features of the operator's board, made a careful study of the arrangement from the standpoint of the trainman. The outcome was an entire rearrangement of the operator's board. All apparatus on the front end of the car is inclosed, avoiding unsightly piping, wiring, etc., and improving the appearance of the car. In accordance with the practice on its Cincinnati division, the National cash register is used to record fares.

The new car is equipped with the most modern type of toilet, and the latest sanitary standards have been observed in providing iced water for passengers. Another special feature of the de luxe car is a luggage compartment, situated opposite the toilet.

Remarkable Acceleration and Speed Shown in Tests

In the official tests of these cars, conducted by the railway and representatives of Westinghouse and General Electric, respectively, recently concluded, results were obtained that exceeded all expectations. These are summarized in Table II.

No interurban car has ever equalled the speed developed by this new equipment. Many miles have been "clocked" by competent and experienced observers in which the new cars ran better than 90 m.p.h. The particularly remarkable thing about these cars is that at such high speeds their riding qualities are better than those encountered upon many Class 1 steam railroad observation cars on crack trains. There is a reassuring absence of side sway, tremor or vibration. The passenger enjoys the exhilaration of air flight, where no air pockets are encountered, but without its noise and vibration. In the earlier days of operation, many men who thought they had fast automobiles tried their luck in racing these fliers. They were soon left far behind. Certain of the de luxe trains overtake and pass such steam trains as the "Ohio State Limited" to the great amusement and gratification of the interurban's passengers.



The fast trains broke into the movies by winning races against an automobile and an airplane

The Cincinnati & Lake Erie Railroad, like the typical interurban, runs on city streets in several places. The high speed of its equipment is not required for city service, but it enables the cars to make up for time lost in necessarily slow operation on these streets and to land the passenger at his destination in such good time as to induce him to use the interurban in preference to the steam railroad or his own automobile.

Illustrating the advantages of speed, on the Toledo division, the average schedule speed of the de luxe runs on private right-of-way, i.e., excluding city streets, is 46.25 m.p.h. The average schedule speed under such conditions on the Columbus division is 54.1 m.p.h. In other words, this new equipment, like the fleet automobile, when on city streets can observe traffic regulations and the requirements of safety, but make the required schedule by sustained high speed in open country.

"We're in the Movies Now"

The Cincinnati & Lake Erie achieved the goal of all publicity men by breaking into the movies when *Pathé News Weekly* made a sound film record of the staged race between one of its flyers and an airplane. This footage was incorporated in a regular *News Weekly* which has been shown to millions of people all over the

Table II—Results of Speed and Acceleration Tests on the New C. & L. E. Cars

	Coach Type Cars, Equipped with General Electric Motors	Observation-Type Cars, Equipped with Westinghouse Motors
Rate of acceleration, m.p.h.p.s.	1.7	1.6
Rate of braking, m.p.h.p.s.	5.25	4.95
Distance to stop from full speed, after emergency brake application, feet	918	1,040
Observed free running speed on level tangent track, m.p.h.	79.8	83.8
Average d.c. energy consumption per car-mile, measured at the car, kw.-hr.	3.88	3.89



Each of the blue ribbon trains was given a name in a competition among employees.

United States since Juy 12. Incidentally, the company's executive officers have had many letters of inquiry from interested electric railway officers who have seen this movie in their neighborhood theaters.

Emulating Pathé's example, the Mayfield Photo Service, which produces movie film of interesting events for local theaters, requested permission to arrange a speed contest between a special racing automobile and one of the flyers. It was decided to hold this race between Springfield and Columbus where the National Pike parallels the railway private right-of-way. In order to insure the safety of the automobile, motorcycle police escorts were provided to clear the road. The race was photographed from the interurban car, from an airplane and from fixed locations along the road. The film tells an exciting story. The automobile beat the interurban on the getaway and the succeeding footage shows the tremendous speed which both attained. The motorcycle police found it impossible to hold the pace and gradually fell behind, but fortunately the road at the time was reasonably free of traffic. The racing car tore on, but little by little the interurban forged ahead; when the race was over the automobile was fifteen lengths in the rear.

The large movie houses in Ohio were quick to see the sporting aspects of these thrilling contests. The State Theater in Dayton featured it during the week beginning Aug. 9. At the theater's request, the railway made arrangements to run "The Red Comet" over the city tracks in Dayton. The car was covered with banners on either side, announcing the moving picture feature and was equipped with a radio-phonographic reproducing device to attract the attention of passers-by. An unusually large attendance at the State Theater during the week was reported. Other large moving picture houses throughout the C.&L.E. territory have run a similar film.

The management is convinced that this moving picture publicity is the most valuable advertising which the new service has secured. It dramatized, as nothing else could have done, the epochal character of the new innovation in transportation. It aroused the sporting instincts of many thousands of people; it created the desire to ride upon this new service. Above all, it carried to thousands of motorists the lesson that, from this time forth, the automobile driver should exercise extreme caution in crossing the tracks.

Prior to the inauguration of the new service a vigorous and carefully prepared publicity campaign had been mapped out and was progressively executed. The company's publicity agents furnished news stories to the local press, chronicling in turn the imminence of the completion of the cars, the delivery of the first car, its preliminary trials, the general nature of the changes decided upon, the successive arrival of additional cars, steps taken to train the crews in the new equipment, the work being done by the maintenance-of-way and line departments in preparing the property for the new fast service, and, in general, the revolutionary character of the service contemplated.

In this way, the curiosity and interest of the public and of the newspaper editors were gradually fanned. On Sunday, June 29, the Geyer Company, as the representative of C.&L.E.., was host to some 150 newspaper men and women representing the daily and weekly publications in the various cities and towns served. They were brought to Dayton in the new de luxe observation type cars. At the luncheon explanation was made of the plans for giving publicity to the new service, both through news stories and through paid advertising. Many questions were asked and answered. The guests were returned to their homes in the de luxe equipment. This luncheon greatly quickened the interest of the newspapers in the bold experiment, and gave to their editors first-hand knowledge of the attractiveness and comfort of this new service.

Cars Exhibited in Leading Cities

Between July 15 and 19, a new de luxe type car and a new coach were placed side by side with the old equipment previously used on the I. C.&E. or Lima-Toledo properties, in the public square or other prominent location in Cincinnati, Columbus, Dayton, Toledo, Springfield, Hamilton, Lima, Bellefontaine, Middletown and West Jefferson. This display of the new equipment was currently advertised in the local press. Many thousands of people passed through these cars. Representatives of the company's traffic and operating departments, as well as picked men from among the train crews, were in attendance. In addition to distributing a souvenir booklet picturing the new cars and explaining the high-speed service, these men answered many questions.



Prominent banks co-operated to use window displays featuring the movies of the races won by the new cars

In order to appreciate the significance of the new service made possible with the de luxe equipment, it is necessary to consider briefly the recent



These are reproductions of the illuminated signs carried at the rear of the trains

history of the property. The Cincinnati & Lake Erie Railroad, the president of which is Thomas Conway, Jr., came into existence on Jan. 1, 1930, at which time, coincident with taking title to the Indiana, Columbus & Eastern and Lima-Toledo properties, the Cincinnati, Hamilton & Dayton Railway changed its name. These acquisitions gave the consolidated company a through interurban line from the Ohio River, at Cincinnati, to the Great Lakes at Toledo, a distance of 220 miles, as well as a fast east-and-west line connecting Dayton, Springfield and Columbus. The distance from Dayton to Columbus is 72 miles.

Readers of ELECTRIC RAILWAY JOURNAL are familiar with the notable success achieved by the Conway interests in the upbuilding of the C.,H.&D. property. These interests acquired this property early in 1926 after a checkered career of receiverships, abandonments and prolonged litigation extending over a period of some nine years. Steps were immediately taken to modernize the property. Interurban trackage was reconstructed in large part and rehabilitated throughout; the power supply was modernized, new automatic substations being constructed and an adequate and reliable source of power provided; a modern car shop was acquired at Moraine, just south of Dayton, at which point the company's offices also were established. Finally, all old equipment was scrapped and new equipment was purchased and put into service. The running time was shortened, schedules were rearranged to give frequent and convenient trains, modern methods of selling service and developing traffic were instituted, and a vigorous publicity policy was inaugurated and steadily prosecuted. In consequence, the C.,H.&D., unlike other interurban carriers of Ohio, in the years from 1926 up to the beginning of the current business depression, not only held its traffic against the inroads of the private automobile, but actually increased its passenger revenues. This unusual achievement attracted the attention of the entire industry.

The most rapidly growing portion of the road's business, however, was the freight traffic. This business was handled almost entirely in conjunction with neighboring interurban lines. After prolonged study, the management finally decided that the investment of substantial sums, year after year, in developing freight business, in the face of the highly uncertain future of the connecting interurban lines reaching the principal traffic centers on Lake Erie, was of doubtful wisdom. Accordingly, the C.,H.&D. acquired title to them. The Conway management believed that in addition to freight it could successfully develop a substantial passenger traffic on the interurban lines north and east of Dayton, which connect large centers and pass through farming country and villages.

AUTOMOBILE COMPETITION SEVERE

The railway lines are paralleled throughout by improved concrete highways, the National Pike between Dayton and Columbus and the Dixie Highway between Toledo and Cincinnati. The I.,C.&E. and Lima-Toledo lines in past years have felt the full force of automobile competition, and in earlier years were subjected to motor bus competition. These motor bus lines were acquired by the Conway interests, in conjunction with the interurban properties. At once the motor bus and rail passenger rates were made identical, and tickets interchangeable, making it possible for the passenger to use either the rail or the bus, as he might elect. Motor bus and rail schedules were co-ordinatd.

Prior to the acquisition of the I.,C.&E. and Lima-Toledo lines, the management made a thorough survey of their passenger traffic possibilities. The conclusions were that the possibilities for the development of local traffic, of the type formerly handled on the I.,C.&E. and Lima-Toledo properties, were either non-existent or exceedingly limited. Some additional traffic would doubtless be attracted by new, attractive modern and fast cars, operated in local service. Dr. Conway became convinced that the only promising field involved the creation of a brand new type of service to attract long-distance pas-



The movies were well advertised by running cars covered with banners through the main streets of several cities

sengers between Cincinnati and Toledo, Cincinnati and Columbus, Dayton and Columbus, or Dayton and Toledo, for example—distances ranging from 71 to 220 miles. The development of this business, however, involved getting the roadway into condition to permit of very high-speed operation and evolving a type of interurban car which would embody the comfort and speed which the management believed the public demanded. Early in 1929, prior to taking title to the other properties, an extensive rehabilitation program was inaugurated to permit of high-speed operation. At the same time a new type of flashing light highway crossing signal was evolved by the company's staff and installed at important highway grade crossings on the property.

On Sunday, July 6, the new high-speed through service with observation-lounge car equipment was inaugurated. This consists of three daily limited trains each way between Cincinnati and Toledo, with connections for Detroit; three each way between Cincinnati and Columbus, and two additional de luxe limited trains between Dayton and Columbus. This gives the passenger traveling between Cincinnati and Dayton the choice of six limited trains. The passenger between Dayton and Columbus has the choice of four limited trains, while traffic between Dayton and Springfield is served by seven limited trains in each direction daily. In addition, the local service is retained without change.

New Reduced-Rate Excursion Tickets Introduced

The management is convinced, as a result of its experiments in the past two years, that many interurban railroads have advanced their fares to a point beyond that which will yield the maximum return; certainly this was true on many parts of its own property. The public compares first-class interurban service more closely with bus service than with steam railroad service. An endeavor to charge fares approximating those of a steam railroad drives traffic to any competing buses, or to the private automobile. The company believes that the aim should be to improve the load factor—the proportion of occupied car seats and the number of profitable trains operated daily—and should charge that rate of fare which will produce the maximum operating revenue and the highest load factor.

Coincident with the introduction of the new de luxe service and new equipment in the local service, a system of special tickets was offered at attractive rates, designed to develop business. Prior thereto round-trip tickets cost twice the one-way rate, but under the new plan five-day round-trip tickets between important centers are sold at substantial reductions. Week-end excursion tickets also were instituted. A comparison of rates before and after July 6 between typical important stations is given in Table III.

No extra fare is charged for the de luxe service, either in the coach portions of the car or in the observation-lounge section. A passenger can ride for the same cost on the de luxe service, the regular local service, or in the company's bus lines, as he may elect; the special tickets above mentioned are accepted on all three.

The existing rates applicable to country stops and small towns or villages were not changed, but with special tickets and rates a successful drive is being made for this type of business.

Some interesting experiments have been made in the stimulation of relatively short-haul interurban traffic. In the summer of 1929 a special one-day round-trip rate of 50 cents was offered between Middletown and Hamilton, a distance of about 12 miles, and a special twelve-ride ticket, good for 30 days, selling for $2.50. Previously the round-trip rate was 80 cents, or double the one-way fare, and no special ticket had been sold. The purpose of these experimental rates was to determine to what extent the workers in factories in either city, residing in the other, could be induced to use the interurban rather than their automobiles. In two months the revenue passengers between these cities increased 97 per cent.

On the Columbus division, about 11 miles east of Dayton, is the village of Osborn, at which are the plants of the Wabash Portland Cement Company and the Southwestern Cement Company. These plants employ a considerable number of workers living in Dayton, and many Osborn residents travel back and forth to Dayton to business and to shop. The one-way fare between Dayton and Osborn was 30 cents and the round-trip 60 cents. The one-way rate remains unchanged, but on July 20

Table III—Round-Trip Ticket Rates on the Cincinnati & Lake Erie

Between	Miles	Rate Prior to July 6	New One-Day Rate	New Five-Day Rate	New Week-End Rate
Cincinnati and Dayton	60	$2.90	$2.25	....	$1.35
Dayton and Columbus	71	4.50	3.00	....	2.25
Dayton and Springfield	27	1.60	1.00	....	1.00
Dayton and Lima	93	4.40	3.50	....	2.35
Springfield and Lima	66	3.90	3.00	....	2.15
Columbus and Lima	110	6.80	5.00	....	3.50
Springfield and Columbus	45	2.90	2.00	....	1.55
Cincinnati and Springfield	86	4.50	4.00	....	2.15
Springfield and Toledo	139	8.20	....	$6.00	4.10
Columbus and Toledo	183	8.80	....	6.50	3.90
Cincinnati and Columbus	131	7.40	....	5.00	2.85
Cincinnati and Lima	152	7.40	....	5.75	3.65
Cincinnati and Toledo	225	12.70	....	8.00	4.60

Table IV—Record of Ticket Sales by Weeks

Week Beginning	Tickets sold (equivalent one-way trips)
July 20	189
27	190
Aug. 3	274
10	338
17	488
24	432
31	556

Table V—Earnings of De Luxe Service by Weeks

Week Beginning	Earnings per Car-Hour
July 6	$5.86
13	7.44
20	7.95
27	8.77
Aug. 3	9.43
10	9.69
17	11.02

Table VI—Comparison of Aggregate Receipts from Ticket Sales at Principal Stations of the C. & L. E.

Office	Per Cent Increase: July 1930 Over June 1930	August 1930 Over June 1930	August 1930 Over August 1929
Dayton	16	32	40.5
Columbus	18	46	43
Toledo	16	39	....
Cincinnati	74	662	....

Table VII—Effect of New Service on Local Car Earnings

	Local Rail Service Receipts, Cents Per Car-Mile: Cincinnati Division	Columbus Division	Toledo Division
Average earnings in month preceding inauguration of blue ribbon service—June, 1930	36.9	35.8	21.4
First month of operation of de luxe service—July (de luxe service in effect 25 days only)	36.5	27.7	21.2
Second month of operation of de luxe service—August	37.1	27.4	21.8

the round-trip rate was reduced to 40 cents. This change was advertised in the local newspapers. A leaflet giving the new rates and the schedule of trains was distributed by employees of the company in a house-to-house canvass. The record in Table IV of ticket sales by weeks since this change was made is most interesting.

Encouraged by the success of these experiments, it is planned to cover in similar fashion a number of other communities of secondary size served.

One of the most impressive features of the de luxe service is the steady increase in its traffic and earnings, week by week. The record is summarized in Table V.

According to the statistical studies of the American Electric Railway Association, the average passenger earnings of 34 interurban lines throughout the country in 1929 averaged $9.29 per passenger car-hour.

The increase of travel from the new service also is clearly seen in a comparison of ticket sales at important stations. Table VI shows substantial gains at Dayton, Columbus and Toledo, ranging from 16 to 46 per cent. The showing at Cincinnati has been more spectacular than at any station on the property, the aggregate ticket sales in August being 662 per cent in excess of the June business. The most significant feature of this record is that it has been created in a period of intense depression, when industrial employment and general business conditions were tending downward.



Newspaper representatives from cities in the C. & L. E. territory were brought to Dayton and entertained at a banquet by the company's advertising agents

Earnings of the Local Rail Service Hold Up

The blue ribbon trains make no stops in the rural districts or in the smaller villages and make only a limited number of stops in the larger cities and towns. In the rural districts the de luxe service is not competitive with the local service, which was continued without change. It does offer competition, however, for traffic between the larger communities, which constituted the major portion of the previous business.

The effect of the de luxe service upon the earnings of the local rail service is pictured in Table VII. The astonishing fact disclosed is that, with the exception of the Columbus division, the de luxe service apparently drew no traffic from the locals. The volume of de luxe service operated on the Columbus division between Dayton and Springfield is somewhat greater than on any other division.

Through a subsidiary company the Cincinnati & Lake Erie operates motor bus service paralleling its Columbus division. The de luxe service and the new and more attractive equipment in the local service have diverted about 12 per cent of the traffic from this bus line, although new buses were installed a few weeks prior to the introduction of the new rail cars and no change was made in the bus schedules. The diversion of business is due to the much higher speeds and greater comfort and convenience of the rail service. The scheduled running time from Dayton to Columbus of the local rail service is 40 minutes less than on the bus, while the de luxe service makes the trip in 55 minutes less time than the bus. It was, of course, impossible to speed up the bus service to keep pace with the rail service, both for physical reasons and because of the speed limits stipulated by the Ohio commission and the state law.

A substantial amount of the de luxe business has been diverted from the interstate buses, especially between Cincinnati and Detroit. The scheduled running time of the de luxe service, including the connection from Toledo to Detroit, is 1 hour and 45 minutes less than that of the interstate bus lines. In other words, this epochal experiment seems to show clearly that a fleet, comfortable rail car, embodying de luxe features, to a very large degree will supplant the motor bus in popular favor.

But the most important lesson to be drawn from this experience is that the high-speed blue ribbon service has developed brand new business for the interurban — traffic which theretofore had used neither the local rail service nor the company's bus line. Where this new business comes from cannot accurately be determined. Interviews with passengers on the de luxe trains, however, indicate that it is made up, in the main, of traffic diverted from the steam railroads and from the private automobile. It is perhaps significant that on July 27 the Big Four Railroad withdrew two trains—the east and westbound trips of the "Senator"—between Cincinnati and Columbus. A large part of the de luxe travel has been business which has been stimulated or created through constructive publicity and modern methods of passenger solicitation, much of which would not have moved otherwise.

Interdependence of Industry and Transportation Emphasized

EFFECTIVE publicity and merchandising is being carried on by the United Railways & Electric Company, Baltimore, Md., through its car-rider publication *Trolley News*. To emphasize the interdependence of industry and transportation is the object of a series of articles being presented under the general heading "Arteries of Industry." In each issue of this pamphlet, one of the larger Baltimore industries and its product is described, setting forth its importance in the industrial life of the city and emphasizing the fact that the great majority of employees use the street car lines and that the industry is dependent upon and really owes its development to the transportation service.

The following paragraph, used as a preface to each article in the series, repeatedly drives home the basic thought that:

> Today the strength of American Industry flows through its transportation lines. These brief sketches will aim to tell something about the dependence of Baltimore's great and rapidly growing industries upon public transportation and what is being done to keep pace with this growth.

The industries themselves are appreciative of this publicity and in many cases have asked for additional copies for their employees and customers.

Cost Analyses Indicate Field of the Trolley Bus

By W. J. Clardy
General Engineer
Westinghouse Electric & Manufacturing Company

BECAUSE it permits the economic expansion of the field of street railway business, the trolley bus is a useful tool for increasing transportation revenue. It offers a means of providing service in the smaller cities, serving closely built-up districts that do not quite justify street cars, or extending into new territory in the larger cities with a reasonable investment and low operating cost. Moreover, it saves expensive track reconstruction on lightly traveled railway routes, thus permitting continued service at reasonable cost.

It is interesting to consider the trolley bus from the economic standpoint, in comparison with the street car and gasoline bus under various conditions. An accompanying table gives an analysis of the costs of the three means of transportation for two particular conditions of operation. The figures indicate that the trolley bus is preferable to both the street car and gasoline bus for light traffic routes, but is not as economical as the street car for heavily traveled routes. Obviously, there is a point approaching the operation represented in the heavy traffic table where the trolley bus will serve as economically as the street car. Installations in Chicago, Salt Lake City and Detroit have proved this point to be rather high.

A route which has from light to medium traffic represents the ideal application for the trolley bus. For example, consider a line with a one-way trip of 5 miles, operated with a five-minute rush-hour headway and a ten-minute base headway. The total annual cost of operation, including depreciation, taxes and interest, will be: street cars, $216,000; trolley buses, $169,300, and gasoline buses, $202,500. Thus, there is an annual saving of $46,700 for trolley bus operation in comparison with street cars and $33,200 in comparison with gasoline buses. This, of course, is a specific example based on average operating costs which naturally vary for different sections of the country.

A heavy traffic route presents a different picture. If the travel on the same 5-mile line requires a 40-passenger trolley bus every two minutes it is well to consider the use of street cars. A large capacity car, seating 56 passengers, operating on a three minue rush-hour headway, will provide practically the same number of seats and have a greater margin in rush-hour capacity. The total annual cost of operation, including depreciation, taxes and interest, will be: street cars, $333,700; trolley buses, $395,600, and gasoline buses, $474,000. In this case street cars will effect an annual saving of $61,900 in comparison with trolley buses and $140,300 in comparison with gasoline buses.

From this it is evident that the trolley bus has a very definite field of usefulness. Extensions into new territory, some of which may require street cars after the traffic develops; light traffic trolley lines where track needs reconstruction; well-developed residential districts, and routes with medium to fairly dense traffic represent the most advantageous uses for trolley buses.

Comparative Investment and Operating Costs of the Street Car, Trolley Bus and Gasoline Bus

	Light Traffic Route			Heavy Traffic Route		
Investment Costs	Street Car, 42-Passenger	Trolley Bus, 40-Passenger	Gasoline Bus, 40-Passenger	Street Car, 56-Passenger	Trolley Bus, 40-Passenger	Gasoline Bus, 40-Passenger
Route-miles (double track for street car)	5.00	5.00	5.00	5.00	5.00	5.00
Units required in rush hour and one spare	12	13	15	21	29	32
Cost of each unit	$13,000	$12,500	$10,500	$14,000	$12,500	$10,500
Total cost of rolling stock	156,000	162,500	157,500	294,000	362,500	336,000
*Cost of double track and paving	530,000	.....	.....	530,000	.....	.....
*Cost of contact system, including feeders	41,500	58,250	.....	41,500	58,250	.....
Total investment	$727,500	$220,750	$157,500	$865,500	$420,750	$336,000
*Includes ½ mile of single track to carhouse						
Operating Data						
Rush-hour running time, including layover, in minutes	27½	27½	30	28½	26	28
Base-hour running time, including layover, in minutes	25	25	25	24	24	24
Rush-hour headway (six hours daily), in minutes	5	5	5	3	2	2
Base-hour headway (twelve hours daily), in minutes	10	10	10	6	4	4
Rush-hour schedule speed, in miles per hour	12½	12½	11½	11-3/10	12½	11½
Base-hour schedule speed, in miles per hour	13½	13½	13½	13½	13½	13½
Annual vehicle-miles	506,600	506,600	506,600	844,800	1,268,200	1,268,200
Annual vehicle-hours	44,080	44,080	45,980	73,250	105,130	108,880
Operating Costs						
Energy, in cents per mile (1.25 cents per kw.-hr. for elect'cal energy)	4.13	2.50	5.17	4.41	2.50	5.17
Equipment maintenance, in cents per mile	3.10	5.00	7.00	3.35	5.00	7.00
Conducting transportation, in cents per mile	12.71	12.21	12.41	12.71	11.98	12.16
Maintenance of way and structures, in cents per mile	3.13	1.00	....	3.13	1.00	....
Traffic, in cents per mile	0.12	0.25	0.25	0.12	0.25	0.25
General and miscellaneous, in cents per mile	4.62	5.00	5.77	4.62	4.25	4.70
Total, in cents per mile	27.81	25.95	30.60	28.34	24.98	29.28
Annual cost of energy	$20,940	$12,680	$26,220	$37,250	$31,700	$65,500
Annual cost of equipment maintenance	15,710	25,350	35,500	28,270	63,300	88,650
Annual cost of conducting transportation	64,500	62,000	63,000	107,350	151,800	154,000
Annual cost of maintenance of way and structures	15,870	5,070	.....	26,430	12,680	.....
Annual cost of traffic, in dollars	610	1,270	1,270	1,010	3,170	3,170
Annual cost of general and miscellaneous	23,450	25,350	29,250	39,100	53,850	59,500
Total annual operating costs	$141,080	$131,720	$155,240	$239,410	$316,500	$370,820
Total Annual Costs						
Operating	$141,080	$131,720	$155,240	$239,410	$316,500	$370,820
Depreciation of vehicles (5, 10 and 20 per cent)	7,800	16,250	31,500	14,700	36,250	67,200
Depreciation of right-of-way (3 per cent)	15,900	.....	.....	15,900	.....	.....
Depreciation of overhead (3 per cent)	1,250	1,750	.....	1,250	1,750	.....
Taxes (1.25 cents per mile)	6,350	6,350	6,350	10,540	15,840	15,840
Interest (6 per cent)	43,600	13,220	9,450	51,900	25,250	20,100
Total annual costs	$215,980	$169,290	$202,540	$333,700	$395,590	$473,960

TRAFFIC IMPROVEMENTS

Planned for Kansas City

Greater speed combined with safety is anticipated in recommendations of report to the Chamber of Commerce made by the Erskine Bureau. Extensive use of safety zones and loading platforms, elimination of parking and adoption of a new traffic ordinance are urged

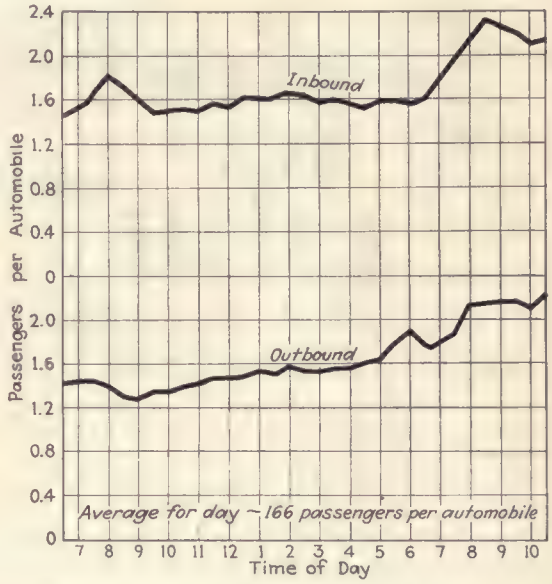
MANY forward-looking recommendations for improvement of traffic conditions in Kansas City are contained in the report of the Albert Russel Erskine Bureau which was prepared for the city-wide traffic committee of Kansas City. The survey was sponsored and the report published by the Chamber of Commerce of Kansas City, of which Conrad H. Mann is president. Preparation of the report, which has required approximately one year, was under the general supervision of Dr. Miller McClintock, director of the Erskine Bureau. This article discusses in brief such of the sections of the report as are of general interest to transportation men.

Design of a balanced and co-ordinated system of traffic control for Kansas City was the primary purpose of the report. The principal specific conclusions and recommendations are contained in a consolidated system of traffic rules and regulation. In the main, the provisions follow along the lines laid out by the National Committee on Street and Highway Safety.

The only legitimate end of traffic control, states the report, is to obtain the maximum convenience and economy of movements consistent with public safety, giving due consideration to the equities of pedestrian, street car and vehicular traffic. Accordingly, all regulations proposed have been carefully weighed with respect to the economic effect, and an attempt has been made to design a system of control which will give a maximum economy in current operations and such improved access as is necessary to provide a stabilization of business site values. In order to spread the traffic load, it is proposed that retail establishments in the central district open at 9:30 a.m. and close at 6 p.m.

Certain special conclusions with respect to safety improvements were considered necessary. It was felt that preventive activities could be amplified during the periods of greatest accident frequency, which are daily from 5 to 6 p.m., weekly on Saturday and Sunday, and in the annual period between August and December, inclusive. It is proposed that an adequate driver's license law should be passed by the State of Missouri in order that drivers' skill and discipline may be increased. Sound driving habits should be encouraged and traffic warning signs be used much more generously than they have in the past.

One of the outstanding features of the report is the plan for parking control. In order to provide an ultimate solution of the intown terminal problem for automobiles, it is concluded that in new buildings special attention should be paid to the incorporation of parking facilities within building lines, or in locations closely adjacent. Business interests should foster the construction of central district garages, further development and utilization of parking lots, and should consider the special advantages to be obtained from the so-called self-contained block.



Passengers per automobile in the central district vary with the direction and time of day

Specific proposals are made for further pedestrian control and protection. Platform safety islands are recommended in the centers of wide streets with heavy vehicular and pedestrian traffic and at street car stops. Temporary minimum protection at such places should be provided by improved button-marked zones. Where such minimum standard temporary zones have been established, the prohibition against vehicles operating to the left of zones at street car stops should be removed.

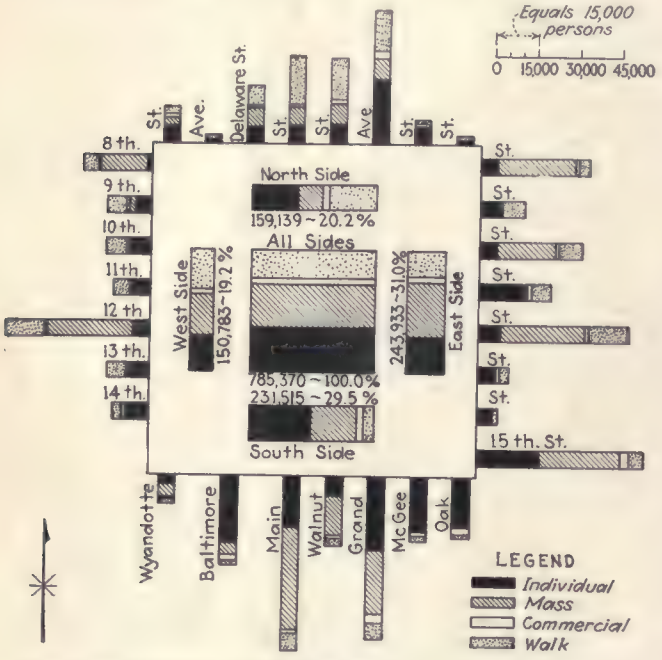
Attention is given to the improved administration of traffic control planning. It is recommended in the report that there be established in the public works department a traffic engineering office, and that certain specific responsibilities in connection with traffic planning and adjustment be assigned to the director of the public works department.

Efforts of the police department to provide adequate and efficient enforcement should receive the firm support of public opinion and of the courts. Better reporting

by patrolmen of traffic violations should be required. Courtesy cards or other mechanisms for extending special privileges to individuals or classes should never be used in the future. A reorganization of the traffic bureau in line with the proposed ordinance also is suggested.

Some Provisions of the Ordinance

The proposed traffic ordinance gives specific attention to traffic signs and signals and their display. The director of the public works department should be authorized to designate safety zones where deemed necessary to protect pedestrians and persons boarding and alighting from street cars. The ordinary sections prohibiting a vehicle passing a street car to the left or while a car



Mass transportation vehicles transport 35 per cent of the persons in and out of the central district of Kansas City and automobiles an equal number

is taking on or discharging passengers are included. Street cars are specifically given right-of-way, and vehicle drivers are required to leave the tracks upon signal. Driving of vehicles through safety zones is prohibited, and where vehicles are permitted to drive to the left of the zone they must not unnecessarily interfere with any street car about to stop.

Drastic provisions would prohibit parking at all times on certain designated streets in the central business district, from 7 a.m. to 6 p.m. in other locations, and from 7 to 9 a.m. and 4 :30 to 6 p.m. in still other places. These designated locations cover practically all of the business district.

Through streets are established to a greater extent than ever before and include nearly all of the street car routes. All vehicle drivers entering such through streets are required to make a complete stop before advancing beyond the property line.

Traffic Control of Utmost Importance

Street traffic is one of the most pressing physical problems confronting the community is the conclusion of the report, and the most certain and economical relief is to be found in carefully designed plans based on competent analysis. In conducting the work the committee and the staff were guided by two objectives: first, the maximum protection of citizens from injuries and death from street accidents; and, second, the maintenance of a reasonable facility of movement of all types of traffic in order that the city may obtain the greatest possible convenience of street use and that the commercial development of the community may be according to a pattern which is not distorted by lower accessibility resulting from congestion.

An attempt was made to give due consideration to the requirements and equities of the various classes of street users. Since pedestrian traffic makes up a large part of the total flow, primary attention was given to its requirements. Street car traffic is a second important factor. On this point the report states:

> Street car traffic is another highly important factor in traffic flow. This importance is derived partly from the fact that mass carriers perform a vital and basic service in community transportation and carry a substantial proportion of the personal movements within a city. Their importance is likewise partially derived from the fact that the operating characteristics of rail units differ materially from those of free-wheel traffic, and that due consideration must be given to these characteristics in the design of regulations, both for the purpose of facilitating street car movement and for the purpose of reducing the obstruction offered by street car operation to other types of traffic.

Automobile operation, the third important factor in traffic flow, represents the largest volume of movements, and, in its spectacular development in Kansas City as in other large cities, has tended to concentrate attention upon its special demands.

The purpose of sound traffic control engineering is the design of traffic regulatory methods which will make increases in volume of all types of traffic possible. Proper physical facilities, sound rules and regulations, adequate control mechanisms, correct education of the general public and firm enforcement of the traffic regulations are all necessary to reduce interference between the various classes of street users to a minimum.

Consideration in detail is given of present street traffic conditions in Kansas City. A city-wide study of traffic volume was conducted. In the central area all of the streets were found to be carriers of large volumes of traffic. Street car traffic was likewise studied and charted. Notwithstanding a constant and steady increase in population, it was found that there has been a general and gradual tendency toward a decline in the number of revenue passengers on mass transportation vehicles per annum, and a very substantial decline in the number of rides per inhabitant. This is stated to be on account of the tremendous increase in automobile registration. The report holds that it is entirely possible that the future will show a less rapid increase in the rate of automobile registration, and therefore in automobile use. It is more than likely, therefore, that, with population increments remaining relatively constant, the future will show a tendency toward a less rapid rate of decline in mass carrier transportation, and possibly an actual upturn of the curve.

On the subject of building heights in the central district, it is recognized that the problem of traffic congestion both within the district and along the arteries leading to it has reached a point of acuteness at the present time. With the development of larger-capacity structures in the central district in the future, these traffic and transportation demands will be materially increased. It is important, therefore, that control planning and the planning of physical facilities for the city be undertaken concurrently with the developments of these greater demands.

Methods used by individuals for reaching and leaving the central district were determined by making a cordon count along the lines of Eighth Street, Oak Street, Fifteenth Street and Wyandotte Street. A check was made of all persons entering and leaving by each street and by each means of transportation. From the cordon count it was possible to analyze the modes of transportation used and the proportion of the total flow carried by each agency.

Passenger automobiles accounted for 35.56 per cent of the total traffic, while the street car was next in importance, carrying 33.45 per cent. The proportion of walkers was unusually large, amounting to 23.67 per cent. This is held to be because of the proximity of densely inhabited residential areas. The total of the remaining movements is relatively light.

The number of passengers per automobile was found to run between 1.2 and 1.8, averaging slightly higher than in other communities, in which the average number of passengers per car ranges about 1.5.

From a comparison of the number of vehicles and the number of persons entering and leaving the business district it was found that, while the automobile carried 35 per cent of the number of people, it accounted for 78 per cent of the total vehicular movements. On the other hand, while the street car carried 33 per cent of the passenger movements in and out of the district it only contributed 4.98 per cent of the total vehicular movements. Street cars as well as the other mass carriers, including buses, are revealed as relatively economical users of street space, without consideration of their special operating requirements and characteristics. "It is obvious," states the report, "that the great problem of traffic control with respect to convenience and congestion must of necessity be centered upon a proper regulation of the activities of motor vehicles, inasmuch as these compose 78 per cent of the total number of units entering and leaving the central business district."

Two interesting charts in the report are those of the number of persons entering the business district and the number of vehicles. The comparison indicates on all of the important streets the predominance of automobile traffic in numbers of vehicles. Especial attention is called to Grand Avenue, which carries substantially the largest number of automobiles into and out of the district. The actual number of street cars using Grand Avenue is comparatively small, although more than half of the persons entering the district on this street do so by means of mass carriers.

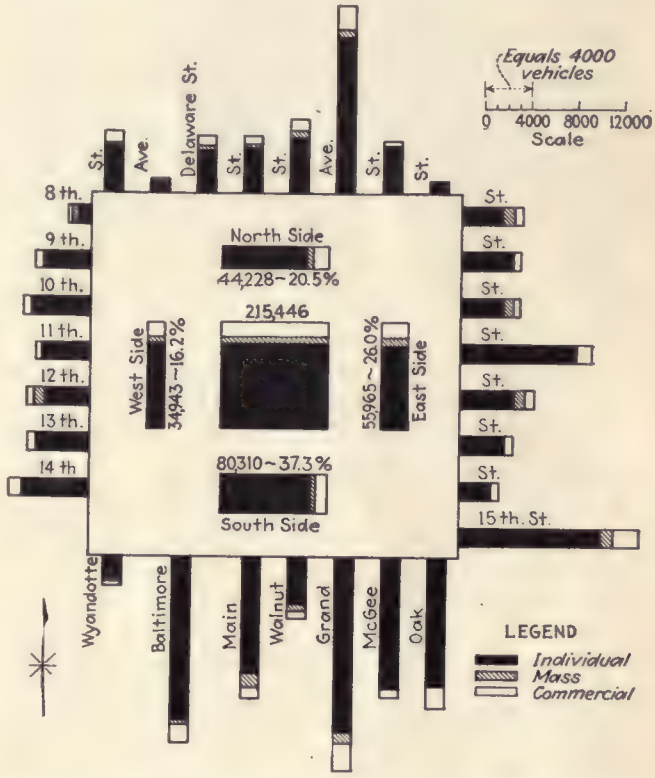
Lowered Accessibility Fosters Decentralization

While it is impossible to effect a complete decentralization of business in any large community without serious violation of economic requirements, yet a tendency toward such decentralization is precisely what is being fostered in every large American city by lowered accessibility resulting from street inconvenience and congestion. The evils of decentralization are not to be found in the logical and normal development of neighborhood business centers. Such centers serve a useful and proper purpose in the economic mechanism of the city, performing services primarily for those who live in the immediate vicinity. General facility of transportation between residential areas and the central business district is quite as important to the development of outlying business site values as it is for the central area.

To determine the trend of community development, a plot was made of all retail drug and grocery stores in the city. These were taken as typical in any neighborhood development. It was noted that the locations definitely followed the principal lines of traffic and transportation activity. The principal vehicular routes as well as the principal railway routes are great stimulators of business activity.

Effects of Mode of Transportation On Purchases

With the co-operation of the Kansas City Merchants' Association and its members, the investigation was extended to determine the relation between the number of purchases and related data with the mode of transportation used by the customer. During a single business day each customer in seventeen of the important retail establishments of the central district was interviewed by sales persons as to the mode of transportation used. The amount of each sale was recorded in relation to the transportation method. It was found that mass transportation, including street cars and buses, contributes almost 60 per cent of the number of purchases made. Total automobile traffic accounts for approximately 33 per cent. Walkers were relatively unimportant in the number of purchases made.



Private automobiles represent 78 per cent of the vehicle traffic in the central district and mass transportation vehicles only 5 per cent

When relative purchasing power is considered, it was found that street car and bus patrons contribute somewhat less than 40 per cent of the total sales volume. Automobile patrons contribute more than 50 per cent of the total value of purchases. As it might be expected, the average amount purchased varies greatly, the individual purchase of the customer arriving in a chauffeur-driven automobile being approximately three times that of the street car or bus rider. This is to be expected, since the street cars and buses carry workers in the central district who make purchases incidental to

their daily work, while those who are driven into the district by chauffeurs come for specific purposes, particularly for making large purchases.

Another survey was made to determine the time at which sales are made. The peak in number was found to be between 12 o'clock noon and 1 p.m. The late afternoon hour, from 5 to 5:30 p.m., showed a marked decline. This was believed to be because the time remaining after the offices closed was too short to attract persons making substantial purchases. The value of sales, however, did not follow this same trend, the maximum being reached between 2 and 3 p.m. This latter corresponded with the maximum number of persons checked into the store by actual count.

As a result of this survey it was recommended that the retail store hours be changed so that they will open at 9:30 a.m. and close at 6 p.m., instead of opening at 9 a.m. and closing at 5:30 p.m. This would not only remove the store employees from the mass transportation vehicles at the time when office workers are traveling, but would give office workers, leaving their places of business at 5 p.m., a full hour for shopping.

Study of automobile parking was given a great deal of consideration. Apart from loading and unloading and stopping of vehicles at the curb for a short time while persons are engaged in shopping or other business activities, the principal use of the parking space is by those who leave their automobiles all day or for a long period. On this point the report says:

> Need for facility of movement and maximum use of existing curb space leaves no legitimate place in the control scheme of any congested business district for long-time parking. It is a very low-grade use of valuable public property, every foot of which is required for maximum business activity. It is only equitable to both business concerns and to the general public to require that this type of parking be ruled from the streets and provided for in private facilities.

Actual measurements showed that, while all of the curb space in the central district would be sufficient for parking 8,900 more automobiles, deductions for fire hydrants, driveways, alleys, bus zones, safety zones and no parking areas leave only 4,315 spaces available for general parking during the business day. Within the same district there are off-street terminal facilities for 15,165 cars. Kansas City is thus in a more favorable position with respect to intown automobile terminals than any other city of comparable size for which figures are available.

Observations of all parked cars by half-hour periods during a normal business day resulted in checking 34,076 vehicles. The average parking time was one hour and two minutes making a total of 35,358 vehicle-hours. Of the vehicles, 26,621, or 78.12 per cent, parked one hour or less. Parking was found to build up rapidly in the morning. Until shortly after 8:20 a.m. the parking load exceeds the legal capacity. From 9 a.m. to 5 p.m., however, the load of parking never exceeds the maximum legal limit and indeed falls substantially below. The surplus of curb space revealed during the hours of the business day is in the lighter business streets, while in typical blocks in the more dense traffic area there is an almost constant overload of parking during all hours. An analysis of the parked vehicles showed that almost 10,000 were parked where parking is prohibited. Since prohibited parking is the easiest of all regulations to enforce, this indicates a definite laxity in enforcement policy. Violation of time limit accounts for the second largest class of parking violators, more than 4,000 vehicles being so checked.

Major Transportation Methods of Customers Compared

City	Per Cent of Total Number of Customers Recorded		
	Public Carriers	Walkers	Automobiles
Kansas City	60.41	5.88	33.71
Washington	57.23	11.22	31.55
Chicago	72.50	19.50*	8.00
San Francisco	60.20	21.80*	18.50
Boston	62.00	23.70*	14.30

*Including those walking from suburban trains.

The remainder of the report is devoted to special regulations proposed. An immediate expansion of the central district signal system is recommended to meet the urgent requirements in the areas adjacent to the territory covered by the present installation. Traffic signs and traffic markings are proposed to make it easier to follow the regulations.

With regard to street car operation it is pointed out that numerous operating difficulties and obstructions come from the necessity to run on fixed tracks. When the tracks are occupied by other traffic it is found impossible to proceed, making not only a handicap to street car operation, but an equal handicap in automobile operation. Hence, it is desirable that a minimum obstruction be offered along street car tracks. Accordingly, it is recommended that the practice now followed in the present ordinance of requiring the removal of vehicles from street car tracks upon suitable signal be continued.

Another means of expediting street car traffic is extension of the system of limited stops recently installed on several lines. The elimination of 291 stops in Kansas City has served to increase average speed on the lines affected by 23.1 per cent.

It is estimated that an extension of the limited stop plan to a number of lines indicated will give an average improvement of 28.2 per cent in street car speed and will greatly reduce interference between street cars and other traffic. Some part of the improved railway speed can undoubtedly be attributed to the introduction of the arterial stop plan along many lines.

Cement Specifications Revised

REVISIONS in the standard specifications and tests for portland cement have been adopted by the American Society for Testing Materials. Eleven items in all were included in the revision, of which nine were concerned with tolerances for testing apparatus.

Strength requirements now include the average tensile strength at seven days for the three standard mortar briquets from a minimum of 225 lb. per sq.in. to 275 lb. per sq.in., and the average tensile strength requirement at 28 days from a minimum of 325 lb. per sq.in. to 350 lb. per sq.in. These revisions in strength requirements will bring the minimum values more in line with the general strength level maintained by portland cement plants throughout the country.

Specifications for high early strength portland cement were accepted for publication as tentative. These are the same as the newly revised specifications for portland cement, except that a maximum sulphuric anhydride content of 2.5 per cent instead of 2 per cent is permitted and that tensile strength requirements shall be 275 lb. per sq.in. at one day, and 375 lb. per sq.in. at three days. In addition, the purchaser has the option to require a test at 28 days, in which case the average tensile strength obtained shall be higher than the strength at three days.



Statistical information and publicity data were effectively displayed in the association booth

Successful Canadian Convention

Held at Ottawa

Trolley buses and fare structures were among principal subjects of discussions. Approximately 400 members and guests in attendance

LIVELY interest in ways to improve transportation service was shown by the members of the Canadian Electric Railway Association at their 26th annual convention held at Ottawa, Sept. 17-19, 1930. At three business sessions presided over by the president, C. H. Dahl, vice-president in charge of operations, Winnipeg Electric Company, a well-balanced program was presented covering practically all phases of railway operation. Following the morning sessions, luncheon meetings were held at which prominent speakers spoke on a variety of interesting topics. The business sessions as well as the luncheons were held in the Automobile Building in Lansdowne Park where manufacturer members had arranged an excellent exhibit of equipment and materials.

In his opening address, Mr. Dahl stressed the necessity for placing the railway's problems before the public. He felt that merchandising practices had not kept pace with the accomplishments in improving service, and urged further efforts on the part of the member companies in perfecting their merchandising programs so that the public will understand the necessity for fare revisions and relief from obsolete franchise agreements. The wide variation in the taxes paid by the different companies, according to Mr. Dahl, shows that effective work along this line has been done by some and neglected by others. Mr. Dahl recommended, for careful study, the report of the committee on publicity and merchandising of transportation.

The greater part of the first session was given over to the reports of committees. The committee on rail corrugation reported that the results of experiments made during the year confirmed its previous investigations. It was recommended that all departments of the tramway companies be encouraged to study and improve wherever possible their engineering practice in the design and maintenance of rolling stock and track. Member companies were urged to continue to install trial lots of intermediate manganese or other low-alloy or heat-treated rails, doing everything possible to encourage co-operation on the part of the rail manufacturers in the matter of improved steel making practice and increased heat-treating facilities. Also, the committee asked that all experimental work and trial lots of rail be followed up during installation and service with scrupulous attention to details and the keeping of complete records.

The committee on motor buses and trucks discussed

the general use of the bus in city and intercity service, and especially pointed out the value of developing special or chartered business. The committee recommended that efforts be made to establish interline ticket sales and co-ordinated schedules.

The committee on publicity and merchandising of transportation, in its report, emphasized the growing need for merchandising of street railway service. An outline on this wide subject on which individual studies may be based and an extensive bibliography with references to A.E.R.A. reports and technical press articles were submitted.

Deviating from the methods used in the past, the committee on safety and accident prevention during this year centered its efforts in obtaining reports from association members and from companies operating in the United States on definite safety practices which had been tried and proved successful. These reports were summarized and presented to the industry in eighteen letters.

Much Interest Shown in Trolley Bus

The second session of the convention was largely devoted to a study of the trolley bus. E. A. West, general manager, Utah Light & Traction Company, Salt Lake City, presented a paper on this subject in which he gave a résumé of his company's experience during the past two years and prophesied a greater use of trolley buses in the future. He presented information on the problems in equipment and maintenance which were experienced with the original vehicles, showing where the greatest percentages of maintenance costs had been spent. His comparison of costs between trolley bus and street car and gas bus operations was particularly interesting. Dividing them into major cost items, he showed how they were effected or eliminated as follows:

Way and structure costs are eliminated entirely. The overhead system costs should amount to no more than twice the cost of maintaining a railway street car overhead system. Because of the light weight and simple construction of the trolley bus, equipment costs, exclusive of tire costs, will not run over three-fourths those of street railway cars. Conducting transportation will be less expensive than for street railway operation due to the higher average speeds attainable with electric coaches. Power costs should be about one-half those for street railway cars, and less than gasoline costs. The latter are usually higher than street car power costs with only two-thirds the seating capacity of an average street railway car. Trolley buses have seating capacities the same as average-sized street railway cars. Injuries and damage costs will be lower due to greater maneuverability, etc. Gross charges to the depreciation account will be lower on account of the smaller investment.

In general, Mr. West stated that operating experience for two years has shown that the operating costs of trolley buses are about 75 per cent as much as those of a street railway car of the same capacity and 65 per cent that of the equivalent carrying capacity in gasoline buses. The interest aroused by the discussion on this subject showed clearly the serious consideration this vehicle is receiving in Canada.

A paper on street railway fares was presented at the Friday morning session by Prof. Albert S. Richey, electric railway engineer. The speaker discussed the fare situation as it exists in the United States, giving a number of examples of different fare structures and methods of collection. He described the flat-rate fare, the wholesale plan—carrying the regular rider at a less price than the occasional—and the zone system. Discussing what he considers a possibly ideal fare structure, Professor Richey defined it as a charge to each rider closely proportionate to the cost of his ride. He stated, "It costs more to carry the occasional rider than the regular rider. Certainly it costs more to carry a passenger 5 miles than to carry him five blocks. It costs more to carry him any distance in the rush hours than the same distance in the normal hours. These costs are capable of fairly exact determination, and an ideal fare structure might be worked out including a ready-to-serve charge of say 2, 3, or 5 cents with a service or mileage charge of, say, 1 or 2 cents for each additional unit of distance ridden. The ready-to-serve charge might vary with the time of day and with the regularity with which the rider uses the service, while the mileage charge also might vary as indicated by cost analyses, or remain with a fixed relation to distance traveled in fare collection requirements so dictated." To make such a fare structure workable, Professor Richey pointed out that it is necessary to "determine the fare properly due from each passenger, to enable that fare to be collected without delay to the service and properly to audit the collection."

The open discussion on the subject of fares brought out many interesting opinions on a number of experimental fares. J. B. Hayes, manager Nova Scotia Light & Power Company, and Mr. Dahl discussed the weekly pass as used in Halifax and elsewhere. Ralph Emerson, vice-president Cleveland Railway, told of the results of the 2-cent zone experiment in Cleveland and H. E. Weyman, vice-president and general manager Levis Tramways, gave the results of a number of fare changes tried on his system. Walter Jackson, consultant on street car and bus fares, Mount Vernon, New York, also discussed weekly passes and permits.

Under the general headings of traffic, fire protection, operation, and maintenance, a number of scheduled "Timely Topics" were discussed during the sessions. At the first meeting, the subject of the effect of traffic lights on street car operation was introduced by D. E. Blair, general superintendent Montreal Tramways, and discussed by W. S. Irvin, traffic study engineer Toronto Transportation Commission. The need for engineering study, the best available equipment and the careful supervision of the operation of the signal system by a traffic engineer, were stressed by Mr. Blair. Mr. Irvin described the experiences with different signal systems in Toronto. He warned against too many lights in a system, stating that a standard should be set up to justify a signal at any particular intersection. As a result of this discussion on traffic, L. Tait, manager and secretary-treasurer London Street Railway, London, Ontario, moved that a committee be formed to gather data on signal systems and equipment. The motion was passed and a committee appointed at a meeting of the new executive committee on the following day.

Methods used to reduce fire hazards and decrease insurance premiums was the topic discussed at the second session by J. P. L. Ryan, engineer and rating expert Johnston & Higgins, Ltd., and W. E. P. Duncan, engineer of structures, Toronto Transportation Commission. At this meeting, A. M. Lindsay, superintendent of rolling stock Montreal Tramways, described the operating features of cars recently purchased by Canadian electric railways.

Welding, as applied to track maintenance and bus

inspection methods, were the topic discussed at the third session. W. A. McRae, engineer of way Toronto Transportation Commission, and J. T. McCarty, manager Metal & Thermit Corporation, led the discussion on welding. H. R. Holder, superintendent of auto bus department Montreal Tramways, discussed bus maintenance.

Luncheon Meetings Popular

At the first luncheon meeting Charles Gordon, managing director American Electric Railway Association, was the principal speaker. He directed the thoughts of the members to the important economic part that the railways play in a community, and showed how the successful operation of mass transportation affected property values, growth of business and the general well-being of the district served. Mr. Gordon dwelt on the traffic congestion problem and pointed out that its solution should be one of the fundamental considerations of a public transportation facility. "Movement of people, not vehicles," said Mr. Gordon, "must be uppermost in the minds of those attempting to solve the traffic problem in any city."

Hon. T. Ahearn, P.C., president Ottawa Electric Railway, was the speaker at the second luncheon. He gave an interesting history of the development of the Ottawa Electric Railway from the days of the horse car up to the present time. He told how, in the face of almost incredible difficulties, the first electric service was carried on during the first winter under very severe weather conditions.

At the conclusion of Mr. Ahearn's address, John A. Miller, Jr., editor Electric Railway Journal, presented to Mr. Ahearn a certificate of merit won by the department of rolling stock and shops of the Ottawa Electric Railway. Announcement of this award is made elsewhere in this issue.

The street car and individual automobile service was the subject of a talk by T. Fitzgerald, vice-president and general manager Pittsburgh Railways, at the third luncheon. He showed how the popular acceptance of the automobile, the development and construction of highways and the growth of other forms of individual transportation facilities had affected street car operations in the United States. He urged the railways to realize that these modes of transportation were here to stay and that the future of the electric railways depended on rendering service which approached the automobile in speed, comfort and convenience.

At the last business session of the convention, the following men were elected to serve as officers for the coming year:

Honorary President—Hon. T. Ahearn, P.C., president Ottawa Electric Railway.

Honorary Vice-President—Acton Burrows, proprietor *Canadian Railway and Marine World.*

LEONARD TAIT

New President Canadian Electric Railway Association



LEONARD TAIT, the new president of the Canadian Electric Railway Association began railway work in 1899 as a clerk with the Michigan Central Railroad, at London. He also served with the Grand Trunk Railroad and the Canadian Pacific Railroad, and returned to the Michigan Central Railroad in February, 1905, as chief clerk to the freight and passenger agent, London. He was appointed freight agent of the New York Central Railroad at Toronto, and in November, 1912, became secretary-treasurer of the London & Lake Erie Railway. In 1917 he became secretary and treasurer of the London Street Railway, which position he held until October, 1924, when he became manager and secretary-treasurer.

Honorary Advisory Council—Edward Anderson, K.C., president and general manager Winnipeg Electric Company;

Lieut.-Col. J. E. Hutcheson, vice-president and managing director Montreal Tramways;

Charles A. Magrath, chairman Hydro-Electric Power Company of Ontario;

W. G. Murrin, M.I.E.E., president British Columbia Electric Railway;

J. F. Saint-Cyr, chairman Montreal Tramways Commission;

Julian C. Smith, LL.D., M.E., president Montreal Tramways.

President—L. Tait, manager and secretary-treasurer London Street Railway.

Vice-President—George E. Waller, vice-president and manager of transportation Dominion Power & Transmission Company.

Treasurer—H. C. Patten, comptroller Toronto Transportation Commission.

Auditor—J. E. Richards, manager and treasurer London & Port Stanley Railway.

Executive Committee—The president, vice-president, treasurer, immediate past-president (C. H. Dahl, vice-president in charge of operation Winnipeg Electric Company), and:

D. E. Blair, general superintendent Montreal Tramways;

Maj. F. D. Burpee, vice-president and manager Ottawa Electric Railway;

W. J. Cunningham, superintendent Edmonton Radial Railway;

A. V. Gale, general manager, Hull Electric Company;

W. S. Hart, vice-president Three Rivers Traction Company, and treasurer Quebec Railway, Light & Power Company;

D. W. Harvey, general manager Toronto Transportation Commission;

C. J. Moors, manager Fort Williams Electric Railway;

W. R. Robertson, general superintendent Ontario Hydro-Electric Railways;

K. B. Thornton, general manager, Montreal Tramways;

H. E. Weyman, vice-president and general manager Levis Tramways.

The afternoons of each day were given over to the inspection of the exhibits. Leading Canadian manufacturers as well as a number of American manufacturers were represented.

Following the luncheon on Friday a meeting of the new executive committee was held. It was decided to continue committee activity during the coming year along substantially the same lines as during the year just ended, with the exception that a new committee was created to study the subject of traffic control. The personnel of the committees was also decided. Considerable discussion occurred concerning the best date and location for the association's 1931 convention. It was decided, however, that the final decision on this subject should be deferred for the time being.

Many entertainment features were enjoyed by the delegates. A cabaret dinner followed by dancing was given at the Chateau Laurier on Wednesday evening, and on Thursday evening the grand ball was held. On each day, entertainment was planned for the ladies of the party. On Wednesday a bridge tournament was held in the drawing room of the hotel, on Thursday a sightseeing motor coach tour to points of interest in the Ottawa district was made and on Friday a golf tournament was arranged.

Canadian Properties Continue Excellent Record

STATISTICS of the electric railway industry in Canada, which have been collected and published by the Canadian Electric Railway Association, have been issued for the fourth successive year by the secretary, Eustace Smith, Jr. In the main they follow the form used last year, and abstracted in this paper for November, 1929, page 1049.

Growth of the industry continued through the year 1929, the passenger revenue having increased more than $2,000,000 from 1928, and reaching a high point for the Dominion. The growth from 1900 is given in Table I. Passenger revenue per mile of single track is now 2.58 times as great as it was in 1900, but the trend of operating expenses per track-mile is 3.07 times as great. However, the operating expenses per mile of single track decreased last year for the first time since the post-war peak in 1920. The use of one-man cars has been an important factor in that movement.

For the past several years there has been an improvement in the financial situation of the Canadian companies. While deductions from income have grown steadily the reduction in operating expenses has made it possible to meet all obligations. In 1921 only 19.5 per cent of the total revenue was available to pay interest and dividends; in 1928 the amount available was 33.33 per cent, as against 32.96 per cent in 1927. Wages, however, continue upward, being 98.6 per cent higher last year than in 1913 and nearly 3 per cent higher than in 1928. The rise is nearly twice as great as the increases shown in fares and living costs.

During 1929 the automobile registrations in Canada continued to increase, reaching a total of 1,193,889. This was 133,000 more than in the preceding year, and represents the greatest growth in any single year recorded. The growth in registrations has been fairly steady from 50,000 vehicles in 1913.

The number of revenue passengers continued approximately the same until the end of the war, with a sharp increase to a maximum of 804,711,333 in 1920. Subsequently there was a decline and the top figure was not exceeded until 1928. Last year, however, there was another marked increase to 3.25 per cent above the 1920 peak, making the largest number of street railway passengers ever carried in Canada. In the face of the large increase in automobile registrations in the past four years this showing is considered particularly encouraging.

There has been a remarkable development of the motor bus in Canadian transportation, according to the report. In the figures it is possible to distinguish between feeder buses and special coaches used for interurban work, special fare routes, charter and sightseeing service. From 13 buses operated by electric railways in Canada in 1921 the total has grown to 540 in 1929. The growth is particularly marked in the last four years. In 1929 the number of coaches was 264, an increase of 18 per cent, and the number of feeder buses was 276, an increase of 4 per cent, over the preceding year.

There has been a distinct trend toward the absorption of independent bus lines by the electric railways. Many of these lines running on suburban and interurban routes have been carrying passengers to the centers of the cities and depriving the street railways of their passengers and revenue, according to the report. During the past two years electric railways have purchased the larger and more important independent bus lines directly or indirectly in competition.

As to the comparative efficiencies of passenger vehicles in mass transportation, traffic counts in a typical Canadian city are cited. During the evening rush hour on normal week days in February, 1930, street cars comprised 8.1 per cent of all passenger vehicle movements and 5.08 per cent of all traffic movements, carrying 78.8 per cent of all passenger traffic and occupying 24.1 per cent of the street space taken up by all passenger vehicles. Buses comprised 0.7 per cent of all passenger vehicle movements, carried 1.3 per cent of all passengers and occupied 1.4 per cent of the street space taken up by all passenger vehicles. Automobiles comprised 91.2 per cent of all passenger vehicle movements, carried 19.9 per cent of all passenger traffic and occupied 74.5 per cent of all street space taken up by all passenger vehicles.

During the hour in question there were 466 outbound motor street cars and 200 trailers carrying 57.265 passengers, or an average of 86 passengers per car. In the same period there were 7,486 automobiles carrying 14,422 passengers, or an average of 1.93 passengers per car. It would, therefore, require 45 automobiles to carry the same number as the average street car.

Financial and operating statistics of Canadian electric railways for the years 1922-1929 compiled by the Dominion Bureau of Statistics are given in Table II.

Table I—Canadian Electric Railway Passenger Revenues, 1900-1929

Compiled by Canadian Electric Railway Association

Year	Passenger Revenue: Total	Passenger Revenue: Per Single-track Mile	Passenger Revenue: Trend	Operating Expense: Per Single-track Mile	Operating Expense: Trend
1900	$5,529,687	$8,192	100	$5,237	100
1905	8,932,914	11,265	138	7,463	141
1910	16,125,994	11,660	143	7,319	140
1915	25,579,689	12,211	150	8,622	165
1920	43,279,009	17,832	218	15,757	300
1925	45,185,402	17,616	216	13,811	264
1926	46,810,403	18,516	227	14,414	275
1927	48,289,774	19,521	239	15,046	286
1928	50,164,164	20,050	244	16,438	314
1929	52,302,474	21,107	258	16,102	307

Table II—Statistics of Canadian Electric Railways, 1922-1929

Compiled by the Dominion Bureau of Statistics

	Capitalization: Stocks	Capitalization: Bonds, etc.	Capitalization: Total	Operating Revenues and Expenses: Gross	Operating Revenues and Expenses: Expenses	Operating Revenues and Expenses: Net
1922	$76,949,185	$111,309,789	$188,258,974	$49,660,485	$35,986,872	$13,673,613
1923	76,674,185	122,395,685	199,069,870	50,191,387	36,171,923	14,019,464
1924	76,482,085	137,285,575	213,767,660	49,439,559	36,125,213	13,314,346
1925	58,567,242	163,201,978	221,769,220	49,626,231	35,426,487	14,199,744
1926	57,779,518	158,029,002	215,808,520	51,723,199	36,453,709	15,269,490
1927	58,873,778	163,678,939	222,552,717	53,506,401	37,616,568	15,889,833
1928	50,653,072	170,649,165	221,302,237	55,632,761	38,782,719	16,850,042
1929	54,453,321	167,969,494	222,422,815	58,268,980	40,085,140	18,183,840

	Miles of Track Operated: First	Miles of Track Operated: Second	Miles of Track Operated: Total	Passengers Carried	Tons of Freight	Passenger Car-Miles	Employees	Salaries and Wages
1922	1,725	513	2,238	738,908,949	2,445,425	113,403,912	18,099	$24,988,118
1923	1,736	511	2,247	737,282,038	3,145,803	115,768,713	17,779	25,039,286
1924	1,737	525	2,262	726,497,729	2,546,928	116,438,733	17,379	24,964,440
1925	1,738	543	2,280	725,491,101	2,706,312	115,715,733	16,933	24,543,855
1926	1,684	553	2,237	748,710,836	3,493,457	118,566,321	16,961	24,686,549
1927	1,652	563	2,215	781,398,194	3,269,024	127,062,864	18,090	25,891,020
1928	1,653	566	2,219	808,023,615	3,892,114	128,888,905	18,697	26,494,062
1929	1,637	563	2,202	836,729,851	3,662,765	134,666,564	18,801	26,984,061

By J. ROWLAND BIBBINS
Consulting Engineer
Washington, D. C.

Short Signal Cycles

Speed Traffic and Reduce Accidents

A study of pedestrian psychology in relation to traffic and transportation shows that long cycles will not be observed by all walkers

REDUCTION by one-quarter or one-half of the hazard of pedestrians crossing traffic and transit streets, through the application of design and the intangible factor of human psychology alone, seems worthy of serious consideration by those using and controlling our streets. Mechanical methods and automatic devices often neglect this factor. In the pages of the JOURNAL have been discussed, from time to time, the theory, practice and results of signaling, both good and bad, and their ultimate effect on transportation speed, traffic congestion and pedestrian safety.

Some transportation men, struggling to maintain reasonable speed through the heavy traffic districts, are disposed to let the pedestrian take care of himself, forgetting that all those who use public transportation are pedestrians at some stage of their journey, especially in the signaled zones. On the other hand, most traffic officials succumb to the pressure of unadvised local public opinion, demanding "better pedestrian protection," and as a result, usually impose unnecessary restrictions under which both transportation and traffic fare badly, indeed. Few of these officials seek data to determine the proper balance, and rarely do they take the trouble to ascertain either the dynamics or psychology of the problem.

The whole question was brought to focus by the writer in a recent signal survey under the most severe metropolitan conditions where transit speeds had been brought down to 4 m.p.h. by improper signal control. Here the traffic authority arbitrarily demanded that traffic controls and signal timing should provide sufficient time for the slowest walker to meander across the street from curb to curb, 100 ft. In this survey the normal habits of some 60,000 pedestrians in crossing the streets were timed by stop watch. Fig. 1 shows the results. Taking the group as a whole, the weighted average walking time to cross the 100-ft. street was 20.5 seconds or 4.86 ft. per second (3.3 m.p.h.). Of this total, the "actives" represented 84 per cent; males averaged 5.3 ft. per second (3.6 m.p.h.); the women 4.6 ft. per second (3.1 m.p.h.). The "inactives," men, women and children, 14 per cent of the total, varied between 20 and 24 seconds crossing time, averaging 4.4 ft. per second, (3 m.p.h.). The last class, "slows," very old men and women, cripples and nurse maids strolling across with baby carriages, representing about 2 per cent of the total, took from 25 to 31 seconds, averaging 3.6 ft. per second (2.4 m.p.h.).

The signal system allowed two minutes in the direction of heaviest traffic and one minute for cross traffic. In the center of one of the thoroughfares was a grassed parking strip with fencing, offering perfect pedestrian protection. All "slows" and "inactives" could use it for half-crossings. Despite this, the traffic authority rejected any signal design that would not provide at least 35 seconds cross time at any point, corresponding to a walking speed of only 2.9 ft. per second (1.95 m.p.h.). This interval is three-quarters greater than for the "average" and nearly one-half greater than the time required by "inactives."

The question is, then, what is the fair basis for minimum pedestrian time? And should the signal system be designed for protecting the 98 per cent of active people or the 2 per cent "slows" who always have the protection of the central refuge zones, where they can fall back of the procession with full safety?

This difference between the possibility of half-crossings vs. full-crossings is really the difference between an efficient and an extremely inefficient signal design. The former can produce reasonable non-stop "progressive" traffic movement with very little wastage of crossing time; the latter must involve great time wastage. In practice this always appears as so-called congestion, which is really not congestion at all but unnecessary stoppage.

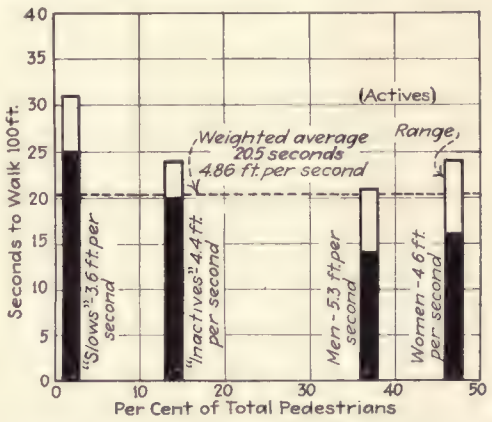


Fig. 1—How long it takes to cross a 100-ft. street was determined from a count of 60,000 pedestrians

The effect of human psychology is very definitely illustrated in this survey. Traffic authorities have imposed on traffic and transportation absolutely rigid restrictions, but enforce none whatever upon pedestrians. In the great city of New York all main traffic is stopped one minute out of every three minutes, or 33 per cent of the time; cross streets just the reverse—all traffic stops two minutes out of every three minutes, or 66 per cent of the time.* The same situation obtains on Michigan

*Within the last few weeks the signal cycle in New York has been shortened to two minutes, consisting of 85 seconds north-and-south and 25 seconds east-and-west, with 5-second stop periods between.

Boulevard, Chicago. All traffic on the north side of the river stops every 100 seconds for 35 per cent of the time; on the south side of the river, traffic stops every 150 seconds for 40 per cent of the time.

And what about the pedestrian himself—his habits, his appreciation of these rigid police requirements imposed upon all traffic, and, of course, all car-bus riders, who form the major volume in daily population movement? Do pedestrians obey these restrictions equally or are they even required to do so by city ordinance and street police enforcement? The answer is well indicated in Fig. 2. Here are analyzed the habits of these 60,000 pedestrians crossing two important streets, one a main high-speed artery and the other a heavy crosstown thoroughfare. The survey recorded in detail two groups. The first obey the signals, crossing only on green. The remainder violate the red "Stop" signal, which traffic

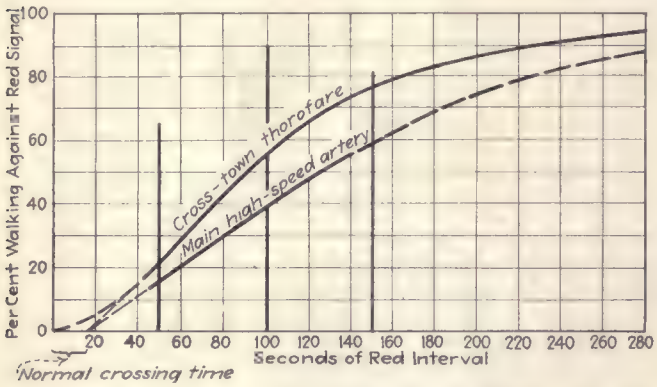


Fig. 2—Violations of the red signals by pedestrians go down as the cycle length is reduced

and transit have to observe for their protection. This expresses the hazard factor. This group is plotted with relation to per cent volume and the length of the red interval.

The disturbing fact appears from this study that the large majority of pedestrians, two-thirds in fact, violated the red signal and deliberately crossed through traffic without waiting for the green, and even without making use of the refuge zones provided for their further protection. The curve "Percentage of Violations" is based upon two main series of timed crossing intervals, one minute and two minutes respectively. Its necessary relation to the origin on the one hand, and on the other the known fact that with still longer signals everyone would finally cross against the red, renders the extrapolation of the curve fairly accurate. While about two-thirds of the pedestrians actually crossed against the long red signal, only a little over one-quarter walked against the short red. As the cycle is shortened, the proportion of violations decreases at even faster rate than the interval itself.

This is the key to the signal situation on all wide thoroughfares. Carrying forward this analysis, in Fig. 3, the "Hazard Curve" per second of red interval is the first derivative of the basic curve of "Percentage Violations." As the cycle is shortened, it is clear that the pedestrian hazard also falls much faster than the proportion of violations. Indications are that with a 20-second red interval, the hazard would be perhaps only half of that for a 30-second red interval, the latter only about a third of that for a 60-second red interval, etc. The writer believes that further investigation should be undertaken, particularly of shorter intervals, at a given crossing where different red and green intervals can be obtained through a wide range. Comparing one street with another is not fundamentally accurate and is liable to give variable and obscure results.

From the preceding it seems to the writer that we must entirely revise our ideas as to protection of pedestrians when they neglect their own interests so far as indicated in this study. It is equally obvious that those traffic authorities who still adhere rigidly and blindly to the old long cycles are defeating their own objective in

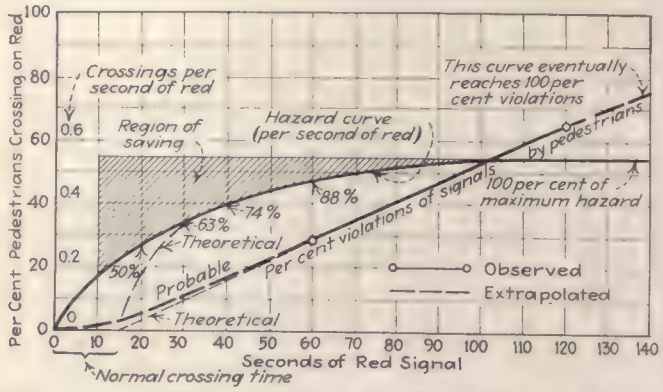


Fig. 3—Short signals save accidents. This was determined by a study of 46,000 observations on a major crosstown thoroughfare

best serving the public, not only increasing pedestrian accidents, but causing a tremendous delay to all.

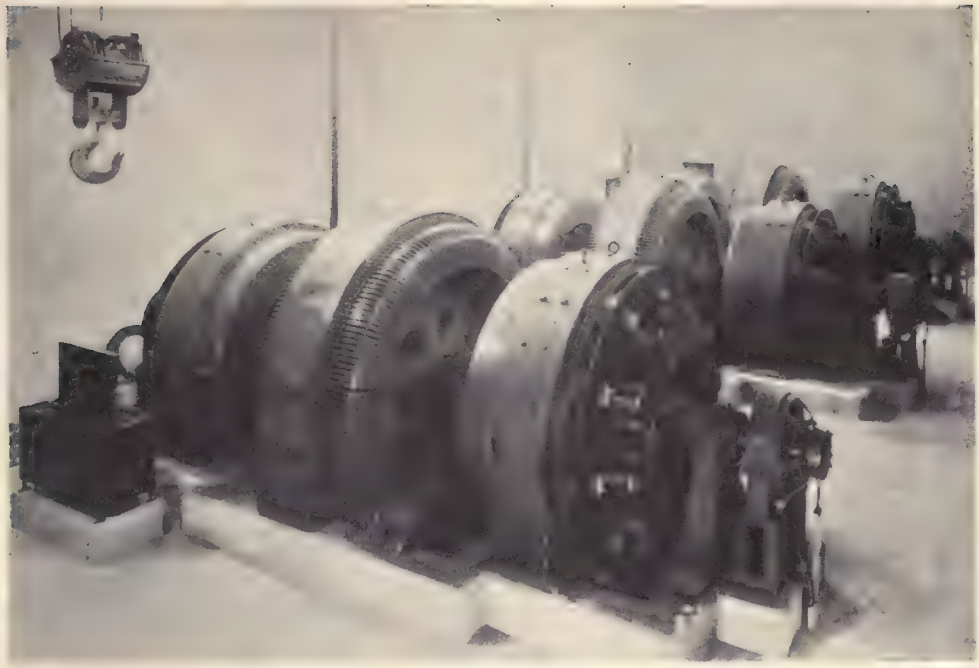
The flexible progressive signal system can be designed to abate or remove these hardships. With reasonable crossing intervals, it is safe to say that our signal systems can be vastly improved, somewhere near in proportion to the improvement in efficiency which the public demands of modern transportation. As a basic approach to this re-design of signals, the writer would suggest that a "normal" crossing time of roadways of 4.5 ft. per second (about 3 m.p.h.) should be used. Furthermore, that very wide thoroughfares, if they are ever to be signaled with any degree of efficiency, must have center refuge zones permitting half-crossings where reasonably needed.

This question of the pedestrian walking time, and his psychology in refusing to conform to the same rigid regulations required of traffic and transit lies at the bottom of the problem. However, American citizens are independent-minded, but amendable to reason and cause. Where armies of policemen are relatively powerless, a little psychology will succeed at practically no cost.

Ice Cars Advertise Product of Railway Subsidiary



Cars operated by the Virginia Public Service Company in a co-operative freight service with its subsidiary, the Newport News Distilled Ice Company, are used to stimulate the latter's business by attractive advertising



One substation contains three 3,000-kw., 3,000-volt synchronous motor-generator sets, each with high-speed circuit-breaker protection. The other substation is similar but only two sets are installed at present

Motor Generators

Supply Power for Cleveland Terminal Electrification

Two substations, one at each end of the system, furnish direct current at 3,000 volts for operation of trains on this heavy electrified system. Complete automatic protection is afforded for all circuits and machines

By
G. R. McDONALD
Transportation Engineering Department
General Electric Company

POWER for the 3,000-volt direct-current overhead contact system of the Cleveland Union Terminals Company is supplied by two synchronous motor-generator substations located approximately 8 miles apart. One station, near the western, or Linndale, end contains three 3,000-kw. units. The other station, about 7 miles east of the terminal, has an initial equipment of two similar units, with an ultimate capacity of three units. The buildings are practically identical, having inside dimensions on the ground floor level of 84 ft. x 83 ft. 8 in. The buildings are divided into three sections, with the main motor-generator room in the center, the alternating-current incoming lines and switching equipment at one side, and the main switchboard and direct-current switching equipment on the other. Ample headroom in the main machine room provides ventilation and the necessary space for an electric crane.

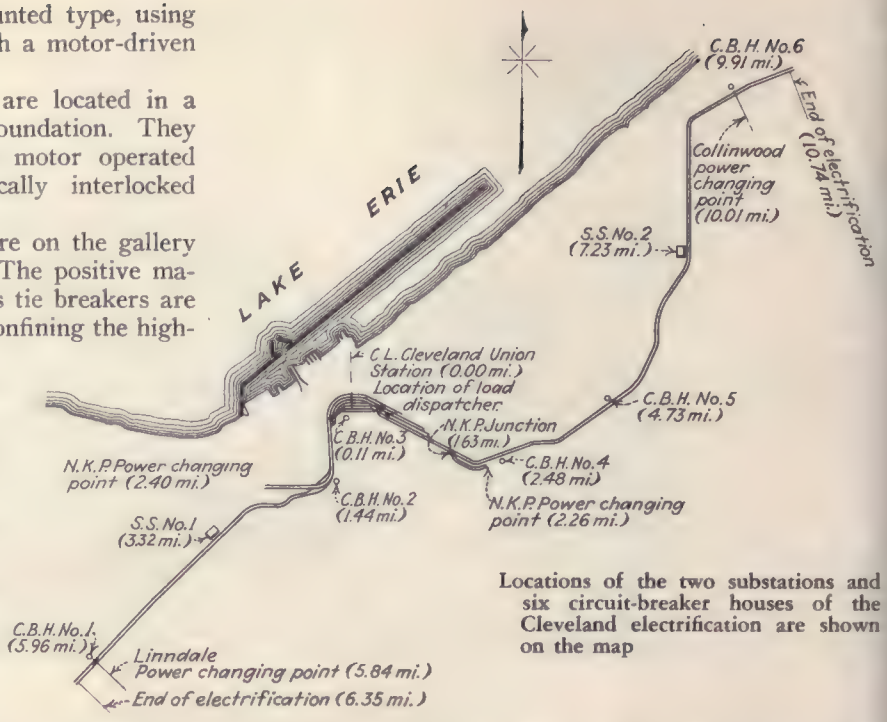
The incoming, or a.c., side of the building is completely walled off from the central machine room. The main switchboard on the other side of the building and the gallery directly above the main switchboard are open to the machine floor. At the Linndale station, the incoming a.c. lines from the Cleveland Electric Illuminating Company enter through six lines of underground cable, which come up to the main floor level through six incoming line breakers and thence to the two bus tie breakers. This bus, located in the basement, is in three sections, each fed by two of the incoming lines. The two tie breakers are so arranged that sections 1 and 2, or 2 and 3, may be connected. The main-line machine breaker and station service breakers are also located in the basement. The arrangement of the east substation is similar, except that the present installation includes only four incoming cable lines. All of the a.c. breakers, with the exception of the starting and running units for the machine, are designed for 15,000 volts and a normal capacity of

1,200 amp. They are of the cell-mounted type, using three separate tanks, and provided with a motor-driven closing mechanism.

The starting and running breakers are located in a cell structure adjacent to the machine foundation. They are also of the three-tank type with motor operated mechanism, electrically and mechanically interlocked against simultaneous operation.

The main and auxiliary d.c. buses are on the gallery directly above the main switchboard. The positive machine breakers, feeder breakers and bus tie breakers are all mounted on the bus structure, thus confining the high-voltage d.c. switching to the gallery.

As a further precaution, all of the relays and other devices used directly on the 3,000-volt circuit except the voltmeters are segregated from the rest of the control and located on a panel in the gallery. The negative machine breakers are mounted adjacent to their respective machines on the main floor. All of the d.c. switching is done by high-speed circuit breakers.



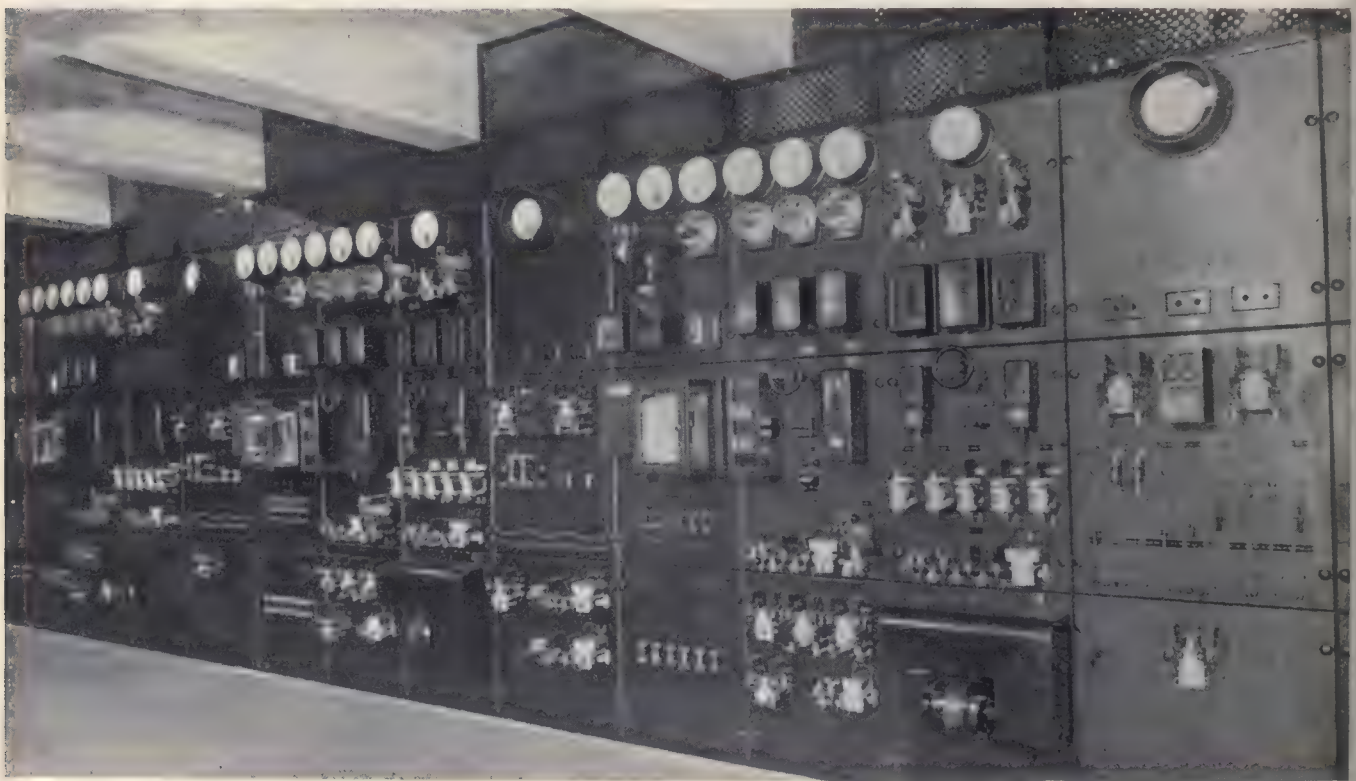
Locations of the two substations and six circuit-breaker houses of the Cleveland electrification are shown on the map

Located in the basement of the station is a Reed continuous-type air filter and a motor-driven fan for each motor-generator set. Ventilating air is taken from outside, cleaned by the air filter and then passed into the foundations of the set. The machines take this cool air from below and discharge it into the main room, whence it finds its way out through roof ventilators.

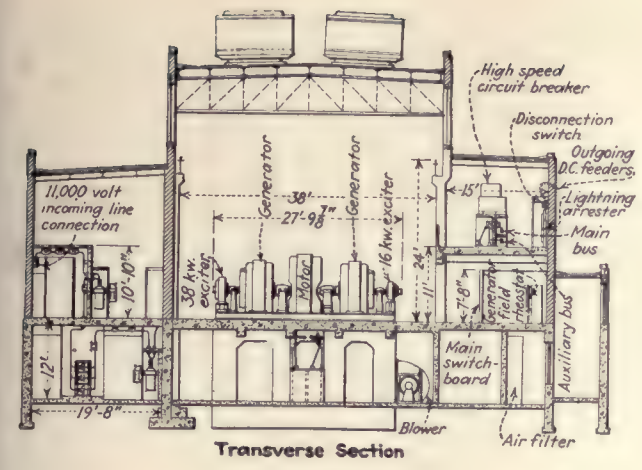
Main Converting Units Are Motor Generators

The motor-generator sets for converting the 11,000-volt, 60-cycle supply to 3,000-volt d.c. are of the three-unit type, nominally rated 3,000 kw. They are designed for handling a 300 per cent load for five minutes, or a 150 per cent load for two hours, after a constant temperature has been attained at normal load. The synchronous motor of the set is rated 3,600 kva. at 360 r.p.m., and is direct coupled to two 1,500-kw., 1,500-volt generators permanently connected in series.

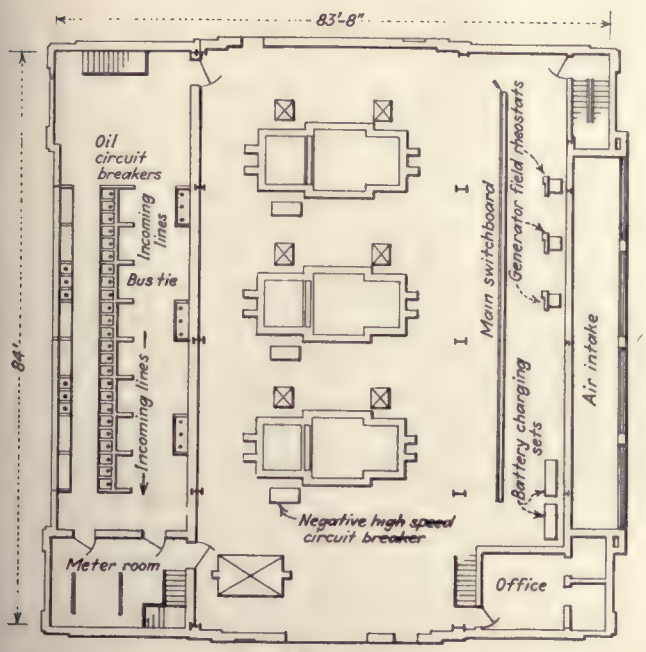
The set is equipped with two exciters. One, rated 16 kw. at 125 volts, supplies power to the fields of the two generators and the second exciter. The other exciter, rated 38 kw., supplies current for the motor field, operating through a range from 40 to 140 volts. This unit also has a series field coil which carries the main load



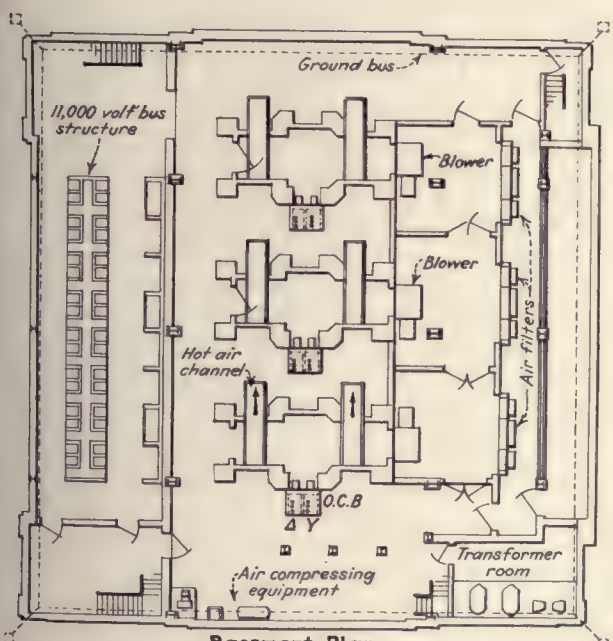
The automatic switching equipment provides complete protection to all circuits



Transverse Section



Main Floor Plan



Basement Plan

Plan and elevation of the Linndale substation showing arrangement of the motor-generator sets and switching equipment

direct current, compounding the exciter voltage and hence the motor field in proportion to the load. This gives a practically constant power factor up to 300 per cent load. At light loads, the power factor has a tendency to lag. In order to compensate for this a relay cuts out a portion of the exciter field rheostat at light loads, increasing the excitation and maintaining a practically uniform power factor throughout the complete range.

The synchronous motor armatures are wound for the incoming power supply at 11,000 volts and no step-down transformers are required. The motor windings are connected in Y for starting and in delta for running, obviating the use of auto-transformers.

Both Local and Remote Supervisory Control Used

The motor-generator sets may be started by either local or remote supervisory control, as determined by the position of a selector switch in the substation. If a.c. power is available and all of the protective devices indicate that the set itself is in condition to be started, closing of a control switch to start up a motor-generator set will actuate a master contactor which, in turn, initiates the sequence. Starting voltage is supplied to the motor, and the set is brought up to speed. The field of the motor is then partially excited with a value of field current which will provide the best condition for making the transfer from starting voltage to full voltage.

As soon as the motor field is properly established, the motor windings are changed from the Y starting connection to the delta running connection. This scheme provides a very smooth transfer from the starting to the running voltage, as during the change from Y to delta there is a 30-deg. shift in the electrical position of the motor windings. The windings are so connected that this phase displacement compensates for the slowing up of the rotor during the time of transfer, and it happens that the amount of drift back of the rotor, during this period, corresponds to almost the 30 deg. made by the change in the winding connections. Next the negative high-speed circuit breaker is closed and the voltage of the generators allowed to build up. One of the two positive breakers is then closed and the generators are ready to have their voltage adjusted to the correct point for connecting to the d.c. bus.

All of the d.c. 3,000-volt switching is done by means of high-speed air circuit breakers. One of these, connected in the negative side of the set between the commutating field and the armature of one of the generators, is set to trip on severe overload or short circuit. On opening, it inserts a limiting resistor in series with the generators and reduces the current to a nominal value. At the same time, interlocks on it open the positive breakers and operate a "field-killing" contactor which inserts a resistor in the generator shunt field circuits. The series and commutating fields of both generators are on the low side of the negative breaker and are consequently connected solidly to the negative bus and the rail. With this arrangement it is not necessary to provide any more insulation for these fields than is ordinarily used for lower-voltage machines. For the positive connection to the bus there are two high-speed breakers, one merely used as a contactor device, while the other is so connected that it will trip on reverse current. This latter breaker provides fast protection if for any reason power is fed from the a.c. bus into the set.

When a set is shut down the field rheostat is run to

a point corresponding to slightly less than normal voltage. While starting, field current is not supplied to the main generators, as the field-killing contactor remains open until after the change is made from starting to running voltage on the motor and the negative high-speed breaker has closed.

If the unit is the first to be started in the station it will not be connected in unless the bus voltage is below normal. A voltage directional relay, together with an indication of low bus voltage, causes the positive line breaker to be closed.

If the bus voltage indication was at normal when this set was started, it would not be connected to the bus but would merely run idle until a reduction in the bus voltage (indicating that a load had caused a drop in the voltage supplied by the adjacent station) would cause the set to be connected to the bus.

Much the same action takes place if other sets are running in a station. However, the voltage-regulating relays then function to maintain the bus voltage at all times. Consequently a reduction in bus voltage cannot be used as an indication of the presence of load, but a current relay, one of which is associated with each machine, gives the necessary indication.

The method of regulating the station voltage and of adjusting the load between the various units is especially interesting. A voltage-regulating relay is connected across the station bus. If a single unit is operating, this relay will function to maintain the bus voltage by controlling the motor-operated field rheostat, and will maintain approximately constant voltage between no load and the maximum rating of the set. At this point the control is taken from the voltage relay by a current relay which will act to maintain constant current output of the set as long as the load demand stays above its maximum current rating. If the set tends to stay at maximum current output for a time exceeding its rating, a thermal relay, which provides an integrated check on the heating, will act to reduce the load on the set.

When two or more units are operating, the control is very similar except that it is modified by load-balancing relays which tend to equalize the load. If the load is equally divided among all the sets, the voltage-control relay will raise or lower all of the field rheostats simultaneously to change the bus voltage. If two sets are operating and the load is not properly balanced, the load-balance relay will tend to restore the balance. One of the units is regarded as leading and the other unit is always belanced with respect to it. By this means the load will be gradually divided properly between the various units, and the rheostats will be controlled in a manner very similar to that followed by an operator.

If two or more sets are operating in multiple and the load is reduced so greatly that one of them tends to reverse, a reverse-current relay, set to act at a very small value, will disconnect the set from the line. This set will continue to run idle until load demand reoccurs, when it will immediately be rebalanced with the bus and connected to take its share of the load.



One of the six circuit-breaker houses and the electrified line of the Cleveland terminal system

Six circuit-breaker houses are used for tying together and sectionalizing the d.c. distribution system. One is located near each end of the electrification, the other four are spaced between the two substations. These circuit-breaker houses are small two-story buildings. The control switchboards, batteries and battery charging equipment are located on the first floor. The d.c. bus structure is identical with that used in the main substations and consists of the main auxiliary bus, together with a bus tie breaker. As in the main substation, all the d.c. breakers are of the high-speed type. The only other apparatus are the necessary storage batteries and charging equipment for supplying power for controlling and operating the breakers of the feeder circuits.

Control of all of the feeder circuits and other equipment in the circuit-breaker houses centers in the dispatcher's office. The apparatus is normally operated from there, although manual control is also provided at each location. The control circuits are so arranged that the breakers are entirely trip free. If a breaker trips on after being closed, the control must first be returned to the opening position before it will reclose.

Complete control of the electrical system is centered in the dispatcher's office, which is located adjacent to the train dispatcher's office in the terminal building. From there four wires run to each station and circuit-breaker house over which the load dispatcher has control. By means of an alarm bell and indicating lights, the dispatcher is immediately informed as to any change in the equipment under his control. Telemetering equipment gives a continuous indication of the loads on the various motor-generator sets. The supervisory system used is known as the synchronous selector system.

The machines and practically all the auxiliary equipment were furnished by the General Electric Company.

Prior to the formal opening of the Cleveland Union Terminal on June 28, both of the substations were in operation for several months while the engine crews were instructed in the handling of the new locomotives. Since that time they have been in practically continuous service.

Determining Utility Depreciation *on a Logical Basis*

By JOHN W. BURKE
Consulting Engineer
New York

Depreciation plays a smaller part in the retirement of property than is usually understood, while obsolescence has a major influence. The need for large reserves is open to question

DEPRECIATION, as the term is popularly used, has several meanings. On all constructed property there may be three kinds of depreciation, physical, service and financial. Before placing a money value on the depreciation of the physical property the nature and effect of physical depreciation must first be considered. For further simplification the element of obsolescence, which sometimes is treated as a part of depreciation, is taken up separately. The examples chosen to illustrate this discussion are chiefly elements of urban electric railway properties, which undergo rather more than the average depreciation on public utilities.

Generally, neither an entire property nor an element of it suffers any loss in capability of service until the process of depreciation is far advanced. Indeed, all stationary structures, such as track and buildings, and even the power house and substation machinery, might be depreciated to retirement and replaced with new structures and equipment without in the least affecting the service, or the comfort and safety of the patrons.

To a slight degree only has depreciation an effect on efficiency, sometimes increasing, sometimes decreasing it. A new car or a new machine requires less power to run it after its roughness, tightness and stiffness are worn off by a period of use. Per contra, it will suffer a slight inefficiency near the end of its life on account of wear and increased maintenance expenses.

In the ordinary class of property, depreciation and its powerful opponent, maintenance, are inextricably interwoven. This is the class of property whose life can be extended by maintenance through minor renewals or repairs. However, some minor elements of property cannot be saved by maintenance. A wooden tie, for instance, if of unusually good quality, or if treated with a preservative, or if laid in concrete or in soil constantly wet, or if subjected to very light traffic, will have a longer life than an ordinary tie. But in any event, it must fail through true depreciation, without any aid from repairs. This is true also of many other items. Many parts are retired not through depreciation, but through obsolescence.

When should maintenance cease and depreciation be allowed full sway? Or, when should a depreciable property be retired? The time for such retirement is when the current cost of annual maintenance exceeds the average cost of annual maintenance by the amount of the estimated annual depreciation. But the annual depreciation depends on the life, and the life cannot be known, even approximately, until near expiration. Moreover, the life can be influenced by the extent of the maintenance. Thus the problem contains two variables, life and maintenance, mutually interdependent but bearing an unknown relation one to the other. It can be solved only by judgment and experience.

Of totally different character with regard to depreciation are machinery and vehicles of the internal-combustion type, such as gasoline-driven motor cars, trucks, cranes, hoists and shovels. They are in a class by themselves. The violent vibration of engine, chassis and body produce defects that cannot be remedied by repairs. True depreciation rapidly ensues, and, in the case of automobiles, there is the factor of style obsolescence.

The difficulty, or, in most cases, the impossibility, of drawing a sharp line of demarcation between maintenance and depreciation is well recognized by practical operators. It is reflected also in the accounting orders of some of the public service commissions which require or permit public utilities to show maintenance and depreciation together in one account.

If the net effect, or the algebraic sum of the forces and influences inducing depreciation of the property less the maintenance tending to offset depreciation, be substantially constant, then the rate of depreciation is substantially uniform, and the total or accrued depreciation of the property at a given time would be in the ratio which the age of the property at that time bears to the total time the property will last in given service. This is the "age-life" hypothesis of depreciation. The age-life theorists, however, assume certain arbitrary life periods for the different elements of the property based, not on actual experience, experiment or research, but on the opinions of a few technical writers whose training and experience, in most cases, are entirely inadequate for an intelligent consideration of the subject.

While there generally can be no precise or accurate measure of depreciation on a merely age-life basis, a practical and fairly approximate measure may be had through careful examination of the property by competent, experienced investigators who examine the visible portions of the property. Due consideration is given to the original quality of the element when ascertainable,

and to its age, history, past service, and other known conditions. From these data there is a practical determination of the advance of the element toward complete wear-out or retirement through depreciation.

Accrued Depreciation Moderate

Physical depreciation, if unchecked by maintenance or repairs, diminishes, of course, the monetary value. Some elements, like land, are generally not depreciated. Others, like grading, are appreciated. In some instances the entire element is subject to depreciation; in others only a portion of it. For example, steel track rails are retired when roughened or weakened by a wear of less than ½-in. on the head. The salvage value is a substantial portion of the cost new. Altogether, in an average property the portion subject to depreciation is substantially less than the total, and the monetary loss due to depreciation is usually but a small part of the total cost.

The monetary loss from physical depreciation is an operating expense. The annual charge to depreciation should be based on a careful examination of the physical property every few years by competent judges, coupled with the routine records and observation of the operating officials. After a term of years, the accrued depreciation should be the sum of these annual depreciations, less the cost of major renewals or replacements. Minor renewals and repairs are covered by charges to maintenance. The province of a depreciation reserve is to afford a fund for large individual retirements that cannot conveniently be met by maintenance charges in any one year.

In logic and equity, depreciation has no effect on the rate base. The rate base represents the property of the owners. Depreciation is an obligation of the users. Except in rare instances, the owners place in public use elements of property which are entirely new, and they are worn down in the service of the public. It is universally admitted that the public itself must repay this service in some form. Yet some, who concede that fact, still illogically maintain that the accrual of this depreciation through a series of years is not an operating expense but should be charged against capital account in determining the rate base.

In those classes of public utilities whose rates are closely scanned by the public, it is sufficiently difficult to secure adequate rates and of questionable wisdom to attempt to collect, in addition, a theoretical amount for an unnecessary and unjustified excess depreciation. This opinion and some others of those expressed in this article are well illustrated in the testimony of several of the ablest executives and operators in hearings before the Interstate Commerce Commission on its study of depreciation accounting under Docket No. 15100, which has been before the commission for the past seven years.

From the testimony in this case it appears that it is not only difficult and impracticable to separate, even approximately, the elements of the physical property restored by current repairs from those retired at long intervals; but the repairs and the retirements alike are properly chargeable to operating expenses. The actual total cost will be the same, however it be distributed in the accounting. Any elaborate accounting on some age-life hypothesis of depreciation will only add a useless extraneous cost.

Service and Financial Depreciations

Service depreciation is an inefficiency or inadequacy below a first-class standard of service, and is, or may be, due to excessive physical depreciation; deficient or deferred maintenance; inferior design, construction or equipment; inconvenient or unskillful schedules; lack of care and courtesy; lack of harmony between men and management, and other similar lapses in administration. The portion that physical depreciation contributes to service depreciation is generally very small, or entirely negligible.

In the meaning that financial depreciation is a diminution of capital due to physical depreciation of the property, such diminution can never occur under normal conditions of operation and management when the property is properly maintained. In case of sale of private property, the retirement reserve fund should be paid over to the purchaser, or the same result effected by deducting its amount from the value of the property new.

Excessive Reserves Objectionable

Treatment of depreciation from the financial viewpoint was clearly reviewed in Interstate Commerce Commission Docket 15100 by the late Robert A. Carter, then a vice-president of the Consolidated Gas Company of New York in charge of finances and accounts. Before the commission he testified in part:

> Provision for repairs should be treated in the same manner as provision for labor or coal or oil or taxes or similar items of expense. The actual cost of repairs should be charged to the operating expenses. In respect to retirement, in order to equalize the effect of property retired so that a disproportionate burden may not fall upon the operations of any one year, the amount provided should be treated as a charge to operating expenses, and a corresponding amount credited to a retirement suspense account . . . against which items of plant and equipment, actually retired, should be charged. . . .

George C. Mathews, then chief statistician of the Wisconsin Railroad Commission, and who had been a member of the sub-committee of the National Association of Railway and Utilities Commissioners which drafted the National classification, in his testimony said:

> The nature and size of reserves to cover retirement losses will vary both with the size of the property and the degree of diversity in its units. Given properties of similar character, the larger property will have less need of carrying retirement reserves. . . . Equalization is needed only for relatively large units of property. . . . For these classes of property no one can forecast lives. Reserves built up on a life basis will have the appearance of scientific handling, but the substance will be lacking. The life of poles or ties or rails may be estimated with some degree of accuracy, but when we come to the very property against which reserves are needed the life estimates are mere guesses.
>
> The rule proposed in the accounting classifications of the National Association of Railway and Utility Commissioners is sufficient to cover the situation, i.e., that a retirement reserve for large sections of continuous structures is sufficient. . . . Proper and adequate reserves need provide only against extreme fluctuations in retirement losses, and experience and judgment should not be subordinated to life tables which, except by accident, cannot be correct.

Besides the large amount of pertinent information brought out by the hearings in I.C.C. Docket 15100, there are similar data found in numerous cases before the courts, all subscribing to the view that large depreciation reserves are unnecessary.

Age-Life Hypothesis Not Borne Out

There is a sharp contrast between the practical and authoritative opinions given in such testimony and the ideas of the age-life proponents. The popular idea of age-life depreciation contains sufficient plausibility to intrigue the impractical or inexperienced. In relation to public utilities it was accepted by many as a prudent provision calculated to safeguard the interests of both the rate payer and the investor. But careful observers

soon discovered that, on the life tables commonly used, it had a tendency to build up excessive reserves.

The origin of these life tables either here or abroad is difficult to trace. No reliable authority vouches for them. Even if an attempt were now made to ascertain the average service lives of the elements of the physical property, it would be extremely difficult to accomplish. If accomplished at all it would have to be revised constantly to correspond with the varying quality and service of the element. And, after all this continuing effort, we should have only the average lives, without any assurance that they would agree, even remotely, with the actual lives on any particular property.

While experienced engineers have recognized for many years that the use of the prevailing life tables must result in the accrual of excessive amounts in the depreciation reserve, an example of this result is afforded in the New York Telephone Company case, a decision on which was rendered Nov. 7, 1929, by three Federal judges sitting in the District Court for the Southern District of New York.

The court found, in effect, that the amount of the depreciation reserve was *prima facie* evidence of the extent of the actual depreciation, despite the contrary claim of the company and other evidence which had been accepted by the master. As this reserve was invested in the property included in the inventory and rate base, the net effect is that it was added in full to the reproduction cost new of the original property and deducted in full through depreciation of the entire property, leaving the rate base as the reproduction cost new of the original property, which is entirely equitable.

To sum up, the courts hold that only the actual depreciation should be deducted to arrive at a fair rate base, but it lies entirely within their discretion to find that the balance in the depreciation reserve is in fact the measure of the actual depreciation and that is what in general they may be expected to do. This was done in the New York Telephone Company case. But the District Court for the Northern District of Illinois, in its opinion in the Illinois Bell Telephone Company case on Jan. 31, 1930, took the contrary view. In this case, the reserve was $26,000,000, while the actual depreciation was found by the court to be about $14,500,000. The entire reserve had been collected from the rate payers and used by the company for extensions and additions to its property, and, in the opinion of the Illinois Commerce Commission, "the extensions and additions paid for from such moneys should not be considered, in arriving at a base upon which to compute rates for telephone service."

The statutory court reversed the commission, holding that the exclusion from the rate base of extensions and additions to the amount of $26,000,000 paid for from the depreciation reserve was clearly erroneous, that constitutional protection against confiscation does not depend on the source of the money used to purchase the property, that the revenue paid by the customers for service belongs to the company, and that the amount, if any, remaining after paying taxes and operating expenses, including the expenses of depreciation, is the company's compensation for the use of its property.

This opinion of the federal statutory court in Illinois appears to reflect the strictly legal view of the depreciation reserve as contrasted with the view taken by the similar court in New York which is in better line with the recent trend of opinion, and is more likely to prevail in future. In both the New York and the Illinois cases, the state commissions, like the court in New York, deducted the entire depreciation reserve to arrive at the rate base. In both cases, the reserve had been invested in the property included in the valuation inventory. It follows consistently that such part, if any, of the depreciation reserve as is in liquid form, such as cash, negotiable securities or other readily convertible property, should not be deducted from reproduction cost new in arriving at the rate base.

These principles are clearly enunciated by the courts, although, through lack of competent engineering evidence in the case, they sometimes fail to give effect to them in practice. The Supreme Court in the case of the United Railways & Electric Company, of Baltimore, Jan. 6, 1930, quoting from the Knoxville Water Company case, said:

> The utility is entitled to see that from earnings the value of the property invested is kept unimpaired, so that at the end of any given term of years the original investment remains as it was at the beginning.

We have just considered two properties in which the earnings permitted of accruing depreciation reserves double the actual depreciation as estimated by the engineers and the commissions.

Should actual depreciation be deducted to find the rate base in a property honestly and efficiently managed, but whose rates are so low as to prevent the accumulation of a reserve equal to the depreciation? That has been the experience of numerous public utility properties during the past ten years.

The Baltimore and Knoxville decisions logically determine that a deduction in excess of the reserve in fact collected from the rate payers is inequitable. Yet it is the almost universal practice to make some reduction for the actual depreciation, even when there is little or no reserve, and no claim of dishonest or inefficient management.

Normal Condition the Proper Standard

Ordinarily, a property comprised of numerous composite parts is in an abnormal condition when new, a condition experienced only once in its lifetime.

Hence the *reductio ad absurdum* of calculating actual depreciation as the relation of a normally operating property to its physical condition when new. Both sound economics and public policy require that the new property, intelligently maintained, repaired and restored, be worn down in the public service until it reaches its natural and normal physical condition, and that thenceforth it be kept as near as practicable to that condition.

Experience shows that the normal physical condition of well-operated public utility properties generally lies between 75 per cent and 95 per cent of new. It is highly desirable that engineers and regulatory bodies give special study to the determination, within narrow limits, of standard percentages for the proper normal condition of the several types of public utility properties, such as gas, light and power, railway, telephone, water-works. In a given case, there also would be found to what extent, if any, the particular property differed from the average, and its normal condition differed from the standard of its type. Then, for example, if it were found that an individual property whose normal condition should be 85 per cent of new was, in fact, five per cent below a first-class normal operating condition, its actual depreciation would be five per cent of 85 per cent, or 4¼ per cent, instead of 19¼ per cent, of reproduction cost new.

Now consider the example cited of a utility whose normal condition is 85 per cent, actual condition 80¾ per cent, and actual depreciation, therefore, 4¼ per cent. A reserve of 4¼ per cent is sufficient to restore it to first-class normal physical and operating condition. Suppose that, to avoid a deduction from fair value, it is required to have 19¼ per cent in the reserve. How can the excess 15 per cent be used in connection with the property whose integrity it is intended to secure? Of course, it can be invested in other property, or in securities. But it cannot be used as it was designed to be used, at least not for the decades or the generations that the property continues in public service. To do so would, in effect, involve the discarding of 15 per cent of property in normal condition and replacing it with new property, which, in due course, would assume the same normal condition, with no interim improvement in the service.

Although little emphasis is usually placed on obsolescence, and the courts and commissions treat it as an incidental part of depreciation, in the majority of public utilities it is, in fact, the greater part. Taking the term obsolescence to include inadequacy, change in the art, change in styles and in public taste, and all other similar contingencies, most of the elements of property are retired, not because of wear and tear and disintegration, but because of obsolescence. And obsolescence concededly cannot be measured by any age-life hypothesis.

There is an impression that obsolescence is likely to be a sudden or abrupt phenomenon requiring an immediate, or at least prompt, change in equipment. But generally there is ample notice of the impending changes, and an alert and efficient management usually can sense them years ahead. It is just a problem of intelligent care and prudent foresight.

Retirement for Economy

Past experience shows that a large part of the retirement results from reasons of economy. Whether units in excellent working condition are discarded because new types are more economical lies within the discretion of the management. If the expected economy justifies the change, and it can be financed, it should be made. The courts have ruled such matters to be within the rights of management. There now is a strong tendency to retire old street railway cars for reasons of aesthetics. Competition from automobiles renders it necessary to make the cars more attractive to patrons. Back of the idea of aesthetics is economy, as the net earnings would be increased by larger gross revenues due to attractive cars.

If the unit or equipment in question is of large value, a reserve should be built up gradually to smooth out the cost of its retirement when that becomes necessary or advisable, and the fund depleted by the several retirements as they occur. All this requires the exercise of good engineering and operating judgment. No possible formula can be substituted for this practical method. The amount accrued and written off at retirement should be the reproduction cost new of the equipment retired. Thus the utility will be credited with the actual cost of the equipment expressed in dollars of the time of its retirement and the investment kept intact.

The installation of new construction, plant or equipment, following retirement of the obsolete items of property, opens a new financial chapter. The capital account should be increased or diminished by the excess or deficiency in cost of the new items of equivalent capacity as compared with the reproduction cost new of those replaced. If the new items are of different capacity, a further proper adjustment should be made in the capital account. Any excess capital is, of course, furnished by the utility and not by the patrons. Any economies resulting from the new plant should be shared with the patrons, after providing a fair return to the utility and a depreciation reserve estimated and accrued in the manner heretofore described.

Trailer Operation Abandoned in Chicago

WITH the recent withdrawal of sixteen trailers from the Halsted Street line, the Chicago Surface Lines has suspended completely its car-and-trailer operation. Prior to this step, on July 18, the last trailers on Madison Street had been removed from service. Trailer service on this east-and-west artery was originally installed in 1923. Principal advantages to be gained from the change are: more frequent service, faster schedules, and greater flexibility in the use of equipment.



Car-and-trailer operation in Chicago which has been suspended to permit more frequent and faster service

Effective July 19, schedules were put into effect for single cars on Madison Street which practically doubled the frequency of service. During the rush hours, cars are now being run on a 60-second headway instead of a train every two minutes as on the previous schedule. In non-rush periods a car is dispatched every two minutes, instead of a train every 3¼ minutes. On night schedules, also, the frequency of service has been increased.

Speed of operation on Madison Street has been increased approximately 12 per cent with the single units. This additional speed has resulted in a saving of 5½ minutes to the passengers traveling from Austin Avenue to the Loop, a distance of 6.92 miles.

In all, a total of 100 trail cars are effected by the changes recently made. These trailers were purchased in 1921 and all are in excellent condition. As soon as funds are available they will be equipped with motors, control, compressors and other necessary apparatus, and placed in regular service on opposite routes. They have double center doors, but no end doors. With two-man operation it is believed that no additional entrance or exit facilities will be needed in certain classes of service.



Central Master Mechanics at the Dayton Country Club, where they enjoyed a luncheon given by the Ohmer Fare Register Company prior to being conducted through its plant

Central Master Mechanics Have Varied Program

COVERING a wide range of subjects pertaining to maintenance, the Central Electric Railway Master Mechanics Association, in convention at the Miami Hotel, Dayton, Ohio, on Sept. 10 and 11, spent a profitable two-day period. Among the topics discussed were modern braking, high-speed motors, transportation developments, motor maintenance, trolley buses, Youngstown cars, sand blasting, car wheels, safety methods, fire protection and journal boxes. A feature of the program was the showing of several sound pictures by E. S. Gunn, General Electric Company. The meetings, presided over by President A. J. Challeen, superintendent of equipment Eastern Michigan Railways, were attended by approximately 100 delegates.

Following the president's opening remarks, the members were welcomed by Mayor McDonald, Dayton; T. E. Howell, general manager City Railway, and Martin Ackerman, vice-president in charge of operation People's Railway.

The first paper, read by Lawrence Wilcox, Westinghouse Traction Brake Company, on "Modern Braking of Electric Railway Cars," was prepared by G. L. Cotter of the same company for the Cedar Point meeting of the C.E.R.A., and was abstracted in the August issue. The paper told of the factors affecting schedule speeds and the need for improving braking performance.

J. B. Corderman, Cincinnati & Lake Erie Railroad, described the modern braking equipment on the new cars of his company, and told of the resulting increase in schedule speeds and the greater safety factor. He also spoke of their maintenance.

In a paper on high-speed automotive type motors, prepared by R. S. Beers, General Electric Company, and presented by E. S. Gunn, of the same company, the weight-saving and other advantages were brought out. Mr. Beers compared the mechanical and electrical characteristics of these motors with the conventional slow-speed type, and related the results of the lighter motors in use on gas-electric buses, trolley buses and street cars.

A. B. Creelman, Youngstown Municipal Railway, described the thirteen new cars recently purchased by his company, and told of the results obtained from them. He cited a few of the troubles in the equipment that developed and explained how these were all remedied.

In the presentation of a paper, "Armature and Motor Maintenance," O. C. Wright, St. Louis Public Service Company, defined the term "maintenance" and outlined the basic principles for planning any successful program. He outlined the details which should be given especial care, and presented a complete program of tests and repairs. Mr. Wright described the tests and checks in the order in which they should be made and gave several valuable notes on the dipping, baking and handling of armatures.

In his address, "Recent Developments in Transportation," S. B. Cooper, Westinghouse Electric & Manufacturing Company, pointed out that four fundamental objectives in securing higher income or lower expenses, were being sought: reduced weight, lower floor and step heights, less noise, and faster service. The first three objectives, Mr. Cooper indicated, are largely influenced by the motor equipment, and the fourth by both motors and control. To obtain the full advantage of lighter and smaller motors, it was necessary, he added, to develop a form of gearing that would permit higher gear ratios, smaller wheels and a reduction of noise. Mr. Cooper showed how the WN drive had met the requirements satisfactorily, and gave figures on the life of these gear units. Other recent developments covered by Mr. Cooper included variable automatic control, trolley buses, and high-speed interurban cars.

Principles of Trolley Bus Maintenance

Developing the subject of trolley bus maintenance, Walter C. Becker, Chicago Surface Lines, outlined the basic principles of maintenance for street cars and motor buses, and pointed out that the trolley bus system must be based on all of these. Mr. Becker particularly emphasized the importance of a comprehensive maintenance system with fixed periods, based strictly on mileage, for servicing, inspection, repairing, unit replacement and overhauling. In concluding, Mr. Becker outlined definite procedures for daily inspection, lubrication, unit change and general inspection.

In a discussion which followed, concerning the use of the trolley shoe, E. J. Jonas, E. M. Lunda, A. J. Challeen, and G. R. Green, participated. The discussion was supplemented by reading a letter from J. H. Lucas, Milwaukee Electric Railway & Light Company, in which the results of polishing of trolley wire with graphite and using trolley shoes were given.

"Modern Sand Blasting" was the subject of a talk by C. T. Hertzsch, American Car & Foundry Company. The speaker described an effective but inexpensive sand-

blasting outfit, and told of the advantages and savings of installing one. Mr. Hertzsch also gave valuable pointers on selecting and conditioning sand, blasting thin sheets, maintaining the equipment, making adjustments and using primers.

An organized body, headed by a safety authority, to educate employees and obtain their interest, establishment of strict rules and enforcing them are necessary for maintaining a successful safety policy, according to F. H. Humphreys, American Car & Foundry Company. The speaker particularly urged the 100 per cent use of goggles, and cautioned that goggles of the correct type must be used. Mr. Humphreys pointed out that, aside from the humanitarian aspect, a safety campaign and use of modern devices result in enormous savings for the company.

G. E. Doke, president, Association of Manufacturers of Chilled Car Wheels, presented a paper, accompanied by pictures, on the history of the development of chilled tread wheels. Mr. Doke told of the research laboratory maintained, the careful inspection of plants, and the adoption of standard foundry practice specifications by the member plants. He also described the single-plate type of wheel and related its development and advantages.

"Carbon Dioxide Fire Protection" was the subject of a talk by H. B. Teter, of Walter Kidde & Company. The speaker described the new Lux standard extinguishers, explained the theory of how they snuff out fires, and listed the advantages of this type. The talk was supplemented by moving pictures, showing the effective use of these extinguishers in putting out various kinds of fires.

At this juncture in the program, moving pictures of the Central Master Mechanics being conducted through the Ohio Brass plant at Mansfield during their last meeting, were shown.

The next paper, "Maintenance of Truck Journal Boxes and Brake Rigging," by C. N. Pittenger, G. C. Kuhlman Car Company, was read by H. G. Arthur, of the same company. Mr. Pittenger showed how trucks are being affected by the severe operating and traffic demands of today, and pointed out various truck features which make renewals less frequent and less costly. Among the truck improvements, described by Mr. Pittenger, were wear plates in journal boxes, bushed half-ball brake hangers, bushed half-ball bolster guides, adjustable balancing hangers, automatic slack adjusters, and drop-forged pivotal plates.

Opinions on Several Topics Expressed

Discussion of the association's questionnaire brought forth the following conclusions: Metal is preferred to wood for sash in new car design; single side body sash is preferred to double for both city and interurban operation; opinion is divided on the use of wide-vision windows; automotive type high-pressure grease fittings are desirable for certain parts of truck and brake rigging, but unsatisfactory for others; pressed pedestal type seat supports are preferred to the open cast type; chromium plating is favored for the finish of corner grab handles on seat backs; anti-friction center plates, of the new design, with chromium plated ball bearings, are desirable for use; hard coal gives better results than coke for heating and is more economical; water alone is successful for washing cars with lacquer finish, if proper facilities are available, but certain compounds have been developed that assist in this work; use of low-viscosity oils has proved successful in lowering energy consumption.

Through the courtesy of the Cincinnati & Lake Erie Railroad the delegates were given a ride on one of the new high-speed interurban cars of that company. Approximately 45 enjoyed the trip to Middleton and return. At the banquet in the evening, the association was addressed by Judge R. W. Baggott, Dayton. Mr. Baggot reflected on our present modes of living, and discussed entertainingly certain of our present laws which are designed to mold our living habits.

Following the morning session of the second day, the delegates were tendered a luncheon at the Dayton Country Club by the Ohmer Fare Register Company. A feature of the luncheon was an informal address by John F. Ohmer, president of the company, who recalled many points of historic interest regarding the Central Association and presented a broad picture of the present rate question. Mr. Ohmer related the progress made so far, and told of the need for research and detailed analysis on the part of the railways. "Obtaining a scientific fare structure, to assure the most revenue, is largely a problem of studying requirements and educating the public," he concluded. In the afternoon the delegates were conducted through the Ohmer plant, and given an opportunity of studying its products and methods of manufacture.

The Readers' Forum

Street Car Interurbans

South Manchester, Conn., Sept. 14, 1930.

To the Editor:

During a recent trip through the West, I inspected an interurban of the modern type on which millions of dollars have been spent to make it the equivalent of a steam road electrification. But all these improvements seem to fall flat. People do not take it seriously as a railroad.

Now why is this de luxe interurban falling down? There are just four reasons for it:

1. Its steel cars are camouflaged to look like street cars; having street car bells and fenders.

2. Its trainmen are encouraged to believe they are "street car-ing" instead of "railroading."

3. Its motormen are forced to wear the crude old blue street railway uniform. Its management throws up its hands in horror at the idea of the motormen wearing overalls and jumpers.

4. In its advertisements it makes no reference to the railroad service it is giving, but rather uses the word "cars" throughout, which the riding public interprets to mean street cars.

So there you have a super street car line instead of an electric railroad, as it should be.

It is a pity that such interurbans do not realize the folly of imitating old-fashioned street car type interurbans in this modern day.

William H. Snow,
(Twenty years with the interurbans)

Monthly and Other Financial Reports

	Operating Revenue $	Operating Expenses $	Taxes $	Gross Income $	Net Income $
Market Street Railway, San Francisco, Cal.					
Aug., 1930	770,284	643,287*a*	.....	126,997	72,923
Aug., 1929	825,433	680,391*a*	.....	145,042	87,384
12 mo. end. Aug., 1930	9,407,795	7,928,796*a*	.....	1,478,998	805,960
12 mo. end. Aug., 1929	9,578,190	8,156,738*a*	.....	1,421,452	697,813
Northwestern Pacific Railroad, San Francisco, Cal.					
July, 1930	597,419	356,727	35,848	204,787	195,195*b*
July, 1929	613,599	445,219	36,539	131,797	125,625*b*
7 mo. end. July, 1930	3,167,396	2,944,975	252,424	*30,310*	*75,023b*
7 mo. end. July, 1929	3,329,091	3,069,828	265,957	*6,996*	*22,648b*
Capital Traction Co., Washington, D. C.					
July, 1930	306,527	251,825	20,665	36,689	4,935
July, 1929	336,897	261,108	24,151	54,270	22,567
7 mo. end. July, 1930	2,431,706	1,771,873	186,100	488,890	274,026
7 mo. end. July, 1929	2,538,187	1,791,009	197,730	567,038	352,866
Aug., 1930	314,513	246,034	22,527	46,148	16,103
Aug., 1929	325,831	257,039	22,944	45,846	15,691
8 mo. end. Aug. 1930	2,746,221	2,017,908	208,627	535,038	290,130
8 mo. end. Aug., 1929	2,864,019	2,048,040	220,675	612,903	368,557
Washington Railway & Electric Co., Washington, D. C., (Ry. Dept. only)					
July, 1930	375,365	332,208*a*	.....	63,807	8,456
July, 1929	428,989	356,792*a*	.....	95,900	38,488
Jacksonville Traction Co., Jacksonville, Fla.					
July, 1930	78,772	68,953	8,834	604	.....
July, 1929	88,556	78,690	8,995	495	.....
12 mo. end. July, 1930	1,085,234	888,435	106,503	84,031	*70,688*
12 mo. end. July, 1929	1,166,991	946,664	106,622	107,446	*52,192*
Honolulu Rapid Transit Company, Honolulu, Hawaii					
July, 1930	90,581	50,616	9,059	32,351	21,239
July, 1929	88,204	48,497	7,932	32,859	21,636
7 mo. end. July, 1930	607,329	357,140	62,305	196,875	114,737
7 mo. end. July, 1929	615,811	351,800	66,260	205,436	126,874
Chicago Surface Lines, Chicago, Ill.					
Aug., 1930	4,488,146	3,796,705*a*	.....	691,441	680,219*d*
Aug., 1929	5,113,909	4,129,476*a*	.....	984,433	807,925*d*
United Railways & Electric Co., Baltimore, Md.					
July, 1930	1,236,414	855,015	109,567	281,205	14,358
July, 1929	1,328,176	902,717	125,859	313,530	35,763
7 mo. end. July, 1930	9,732,148	6,646,837	942,389	2,220,504	313,440
7 mo. end. July, 1929	9,718,530	6,669,204	944,998	2,207,420	231,450
Aug., 1930	1,198,180	843,513	87,728	276,187	6,119
Aug., 1929	1,307,143	903,403	115,130	302,455	21,410
8 mo. end. Aug., 1930	10,930,328	7,490,350	1,030,118	2,496,692	319,559
8 mo. end. Aug., 1929	11,025,673	7,572,608	1,060,129	2,509,875	252,861
Boston Elevated Railway, Boston, Mass.					
July, 1930	2,371,152	1,958,397	149,674	277,859	*424,295*
July, 1929	2,496,387	1,969,935	125,342	412,871	*285,903*
Eastern Massachusetts Street Railway, Boston, Mass.					
Aug., 1930	624,332	416,493	27,936	190,626	28,399
Aug., 1929	689,272	465,546	30,269	213,292	59,177
8 mo. end. Aug., 1930	5,331,477	3,417,726	234,542	1,760,106	378,241
8 mo. end. Aug., 1929	5,813,685	3,633,666	259,132	2,069,587	641,750
Boston, Worcester & New York Street Ry., Framingham, Mass.					
3 mo. end. June, 1930	187,422	173,993	4,875	9,016	*4,843*
3 mo. end. June, 1929	182,681	158,108	4,875	20,248	6,388
6 mo. end. June 1930	351,175	322,666	9,750	20,358	*7,361*
6 mo. end. June, 1929	343,626	311,579	9,750	23,433	*4,286*
Middlesex & Boston Street Railway, Newtonville, Mass.					
3 mo. end. June. 1930	292,142	222,676	.....	60,202	22,504
3 mo. end. June, 1929	297,550	246,720	.....	42,453	3,732
6 mo. end. June, 1930	600,513	462,455	.....	119,518	42,741
6 mo. end. June, 1929	599,801	492,596	.....	90,508	72,704
Department of Street Railways, Detroit, Mich.					
July, 1930	1,549,503	1,388,112	64,759	101,485	*41,888*
July, 1929	2,134,500	1,631,004	62,023	449,755	309,149
12 mo. end. July, 1930	23,753,814	19,230,965	769,198	3,879,065	2,152,560
12 mo. end. July, 1929	26,502,205	21,005,052	753,333	4,918,566	3,193,925
Aug., 1930	1,516,209	1,363,381	63,560	93,399	*52,773*
Aug., 1929	2,136,238	1,650,272	62,178	432,368	287,182
12 mo. end. Aug., 1930	23,133,785	18,944,074	770,580	3,540,096	1,812,604
12 mo. end. Aug., 1929	26,641,025	21,101,478	752,076	4,950,693	3,240,691
Illinois Terminal Company, St. Louis, Mo.					
July, 1930	601,515	441,007	34,849	125,658	87,602*b*
July, 1929	676,206	468,340	23,427	184,439	136,338*b*
7 mo. end. July, 1930	4,363,169	3,082,426	199,999	1,080,666	780,146*b*
7 mo. end. July, 1929	4,758,600	3,292,887	164,235	1,301,351	969,937*b*
Fonda, Johnstown & Gloversville R.R., Gloversville, N. Y.					
July, 1930	60,907	59,334	4,800	5,629	*24,217*
July, 1929	77,124	62,708	7,840	18,851	*11,520*
7 mo. end. July, 1930	545,624	437,036	33,600	122,176	*96,600*
7 mo. end. July, 1929	593,655	451,488	54,880	167,189	*58,008*
Brooklyn-Manhattan Transit System, New York, N. Y. *e*					
Aug., 1930	4,727,623	3,235,744	323,097	1,237,194	465,144
Aug., 1929	4,944,666	3,513,358	298,381	1,210,220	404,645
2 mo. end. Aug., 1930	9,741,200	6,506,803	660,779	2,727,400	1,185,446
2 mo. end. Aug., 1929	10,095,553	7,020,596	632,143	2,583,966	1,012,158
Brooklyn & Queens Transit Corporation, New York, N. Y.					
Aug., 1930	1,827,238	1,485,618	109,638	246,300	120,864
Aug., 1929	1,953,358	1,615,161	102,203	257,552	131,574
2 mo. end. Aug., 1930	3,744,356	2,981,332	217,817	573,824	324,298
2 mo. end. Aug., 1929	3,996,173	3,224,699	219,052	594,741	344,511
Hudson & Manhattan R.R., New York, N. Y.					
Aug., 1930	934,204	499,806*a*	.....	434,398	98,977
Aug., 1929	990,160	520,500*a*	.....	469,660	134,240
8 mo. end. Aug., 1930	8,140,996	4,107,856*a*	.....	4,033,139	1,353,560
8 mo. end. Aug., 1929	8,262,106	4,193,138*a*	.....	4,068,968	1,381,272
Interborough Rapid Transit Co., New York, N. Y.					
Aug., 1930	5,183,166	3,923,530	197,553	1,062,082	*763,482*
Aug., 1929	5,432,698	3,726,407	196,713	1,509,576	*280'146*
2 mo. end. Aug., 1930	10,565,714	7,803,965	396,102	2,365,646	*2,285,084*
2 mo. end. Aug., 1929	10,899,103	7,502,218	399,021	2,997,863	*580,523*
Long Island Railroad, New York, N. Y.					
July, 1930	4,018,939	2,184,746	483,296	1,349,828	1,180,528*b*
July, 1929	4,250,440	2,290,236	446,224	1,511,923	1,357,522*b*
7 mo. end. July, 1930	22,806,397	15,713,514	1,644,218	5,443,173	4,378,427*b*
7 mo. end. July, 1929	23,582,131	15,863,513	1,518,096	6,186,653	5,102,413*b*
New York Railways Corporation, New York, N. Y.					
July, 1930	469,638	413,480*a*	.....	56,158	14,910
July, 1929	546,980	468,855*a*	.....	78,125	15,007
7 mo. end. July, 1930	3,217,624	2,918,844*a*	.....	298,780	13,824
7 mo. end. July, 1929	3,623,277	3,194,278*a*	.....	428,999	4,401
New York, Westchester & Boston Railroad, New York, N. Y.					
July, 1930	224,469	120,856	25,377	79,450	*152,623*
July, 1929	238,506	131,563	24,015	83,675	*144,838*
7 mo. end. July, 1930	1,506,498	829,093	177,138	506,592	*1,103,349*
7 mo. end. July, 1929	1,451,618	888,502	153,680	414,522	*1,086,311*
Staten Island Rapid Transit Co., New York, N. Y.					
July, 1930	243,991	172,173	17,000	54,818	41,021
July, 1929	22,526	118,903	17,000	*113,647*	63,102
7 mo. end. July, 1930	1,445,923	1,093,148	120,500	230,693	176,011
7 mo. end. July, 1929	1,477,942	1,165,422	123,000	189,503	146,685
Third Avenue Railway System, New York, N. Y.					
July, 1930	1,429,730	1,116,731	95,580	241,456	2,066
July, 1929	1,507,860	1,228,495	97,511	206,065	*32,476*
New York State Railways, Rochester, N. Y.					
3 mo. end. June, 1930	1,923,656	1,848,894*a*	.....	107,204	*257,414*
3 mo. end. June, 1929	2,265,029	1,784,378*a*	.....	467,102	94,405
6 mo. end. June, 1930	4,153,235	3,832,300*a*	.....	384,167	*353,087*
6 mo. end. June, 1929	4,821,204	3,705,312*a*	.....	1,044,368	295,016
Cincinnati Street Railway, Cincinnati, Ohio					
Aug., 1930	635,164	441,923	58,645	151,643	*40,878c*
Philadelphia & Western Ry., Norristown, Pa.					
July, 1930	50,893	.....	.....	.....	*470*
July, 1929	63,210	.....	.....	.....	9,906
7 mo. end. July, 1930	402,898	.....	.....	.....	39,560
7 mo. end. July, 1929	460,239	.....	.....	.....	81,154
Galveston-Houston Electric Railway, Houston, Texas					
July, 1930	46,757	26,699	2,549	17,507	.....
July, 1929	51,752	27,753	2,563	21,434	.....
12 mo. end. July, 1930	535,657	311,381	32,581	191,887	*78,159*
12 mo. end. July, 1929	605,423	337,231	31,769	235,882	*34,970*
Houston Electric Company, Houston, Texas					
July, 1930	247,070	155,007	21,902	70,159	.....
July, 1929	277,144	175,103	25,440	76,600	.....
12 mo. end. July, 1930	3,229,626	2,026,460	255,395	965,189	584,163
12 mo. end. July, 1929	3,374,467	2,092,403	287,104	996,925	591,525
Calgary Municipal Railway, Calgary, Alta.					
7 mo. end. July, 1930	590,543	371,943	.....	.....	32,220
7 mo. end. July, 1929	.....	.....	.....	.....	48,193
Edmonton Radial Railway, Edmonton, Alta.					
July, 1930	62,225	43,476	.....	18,748	*478*
July, 1929	67,629	46,568	.....	21,060	713
7 mo. end. July, 1930	490,504	323,842	.....	166,662	1,412
7 mo. end. July, 1929	501,392	314,109	.....	187,282	14,846
Lethbridge Municipal Railway, Lethbridge, Alta.					
5 mo. end. May, 1930	22,778	19,764	.....	.....	*9,913*
5 mo. end. May, 1929	.....	.....	.....	.....	*7,561*
British Columbia Electric Railway, Vancouver, B. C.					
June, 1930	1,144,585	900,425	.....	.....	.....
June, 1929	1,133,017	801,355	.....	.....	.....
12 mo. end. June 1930	14,658,732	.....	.....	.....	.....
12 mo. end. June, 1929	14,047,862	.....	.....	.....	.....
Regina Municipal Railway, Regina, Sask.					
7 mo. end. July, 1930	246,101	168,733	.....	77,368	*50,591*
7 mo. end. July, 1929	.....	.....	.....	.....	14,212
Saskatoon Municipal Railway, Saskatoon, Sask.					
7 mo. end. July, 1930	229,944	158,448	9,013	.....	*18,193*
7 mo. end. July, 1929	.....	.....	.....	.....	14,162

a Includes taxes. *b* Net after rents. *c* Withdrawn from fare control fund. *d* After deducting city's 55 per cent. *e* Including Brooklyn & Queens transit system.

JOURNAL Maintenance Award

Company trophy, individual cash prize and two certificates of merit go to Cleveland. Ottawa Electric Railway wins recognition in Department of Rolling Stock and Shops. Third period prizes announced.

DUPLICATING its performance of a year ago, the Cleveland Railway won the company trophy in the ELECTRIC RAILWAY JOURNAL Maintenance Contest for the year ended July 31, 1930. The keen interest taken by the Cleveland Railway in this contest was shown by the large number of maintenance items submitted, exceeding by a wide margin the number submitted by any other company. Not only were the contributions of this railway numerous, but they also possessed considerable merit as shown by the number of quarterly prizes awarded to its representatives. In the first period of the contest two of the three prizes were won by Cleveland men. In the second period one prize went to Cleveland, and at the third period two were won by representatives of this company. One of the two prize-winning items in the first period was considered by the judges to be the most meritorious item submitted during the entire contest, and was awarded the individual cash prize of $100.

In the Departments of Way and Structures and Bus and Garages, the contributions from Cleveland were so outstanding that the company was awarded two certificates of merit. In the Department of Rolling Stock and Shops numerous excellent contributions were received from the Ottawa Electric Railway. One of these won the quarterly prize for the third period. In view of the keen interest shown by this company and the high quality of the material submitted, the judges unanimously agreed to award the certificate of merit in this department to the Ottawa Electric Railway.

After considering all the material submitted during the contest, the judges were unanimously of the opinion that the best single item was that submitted by Richard Grant, garage foreman, Cleveland Railway. This item, describing a double air chuck used to inflate dual tires, appeared in the March, 1930, issue of ELECTRIC RAILWAY JOURNAL, page 160. A few days before the publication of this item, the JOURNAL learned with keen regret of the death of Mr. Grant in an automobile accident. After consultation with officers of the Cleveland Railway, it has been arranged that the award be made to Mr. Grant's widow, Mrs. Florence Grant, of Lakewood, Ohio.

Richard Grant

AS THE result of injuries received in an automobile accident, Richard Grant died on Feb. 11, 1930, at the age of 39. His passing was keenly regretted by the Cleveland Railway and by all who had known and respected him for his pleasing personality and his admirable qualities as a man. Mr. Grant held the position of foreman of the Berea Garage for several years before his death, and under his leadership many new and improved shop practices were installed. During his association with the Cleveland Railway, which began in August, 1926, he frequently showed a great deal of ingenuity as typified in his contribution to the contest which won the capital individual prize. Mr. Grant is survived by his wife, Mrs. Florence Grant, Lakewood, Ohio.



Certificate of merit presented to Ottawa Electric Railway Company

Won by Cleveland Railway

Third Period Prizes Go to Ottawa and Cleveland



Leonard S. Rose



(In Oval)
J. Mondoux

William Anthony



AWARDS for the third period of the Maintenance Contest were divided between the Ottawa Electric Railway and the Cleveland Railway. In the Department of Rolling Stock and Shops the prize was given to J. Mondoux for his article describing a scheme to increase the life of truck jaws, as practiced in the shops of the Ottawa Railway. To William Anthony, general track foreman of the Cleveland Railway, was awarded the quarterly prize in the Department of Way and Structures for his entry entitled "Levelling Bar Facilitates Track Alignment." Both of these items appeared in the September issue of the JOURNAL. Another Cleveland Railway representative was awarded one of the prizes for his contribution in the Buses and Garage Department describing a connecting-rod boring tool. This item was submitted by Leonard S. Rose, assistant superintendent motor coach department, who has once before won a prize in this department.

For the second time in this contest, the judges were compelled to withhold the prize for the Electrical and Line Department because of the lack of deserving contributions. This situation should spur electrical men to increase their contributions in the next contest, beginning Nov. 1, 1930.

J. Mondoux

AFTER having served five years with the Engineering Corps of the Canadian Expeditionary Force in France, J. Mondoux returned to Canada in 1919 to join the repair department of the Ottawa Electric Railway. He has been in that department since, engaged principally in the repair and overhaul of car trucks and riggings. Recognizing that in no other department of an electric railway can an alert workman accomplish more to facilitate and improve the quality of workmanship by the development of ingenious devices and shop practices, Mr. Mondoux has always taken every opportunity to study shop methods with the hope of developing some new idea which would result in a saving of labor or cost. His efforts have often produced welcomed improvements, one of which is the scheme for lengthening the life of truck jaws, which is described in his winning contribution to the Maintenance Contest.

William Anthony

ATTRACTED by the opportunities to be obtained in a rapidly growing nation, William Anthony left his native land of Greece in 1908 as a youth of twenty, and arrived in the United States equipped with a sound training obtained at the College of Pojrogos. He mastered the English language in a short time. Mr. Anthony possesses the tenacity characteristic of his race. This tenacity has manifested itself through two decades of varied experience, finally bringing him to the Cleveland Railway as a sub-foreman and enabling him to advance to his present position of general track foreman in four months. His first opportunity was obtained with the Westinghouse Electric & Manufacturing Company with which he remained seven years to rise to the position of inspector of shells manufactured for the English Government during the first two years of the war. In 1916, Mr. Anthony became the employment agent for the Lorain Tube Mills, and it was with that company that he began his long association with track construction. Previous to his entering the employ of the Cleveland Railway, he had been track foreman of the Hunkin Conkey Company for one year, and held a similar position with the Lake Shore Electric Railway for six years.

Leonard S. Rose

WITH a background of wide experience in the field of maintenance of transportation equipment, Leonard S. Rose came to the Cleveland Railway in 1925 to assume the position of assistant superintendent of the motor coach department, in charge of maintenance. He was graduated from the School of Science and Technology of the Pratt Institute, and began his career as an inspector of substation construction with the Brooklyn Edison Company soon after graduation. Attracted to the automotive field, Mr. Rose became associated with the Packard Motor Company, which he served for seven years, five of which were spent in the capacity of technical service manager. In the following two years he filled the position of service manager in the New York State district for the White Company. His affiliation with the Cleveland Railway was preceded by a period with the Long Island Railroad as supervisor of maintenance of shop electrical equipment.

New Contest Begins Nov. 1!

Practical MAINTENANCE IDEAS

MANY ingenious devices and maintenance practices have been adopted by the Cleveland Railway. This company submitted a substantially larger number of items than any other railway in ELECTRIC RAILWAY JOURNAL Maintenance Contest ended July 31, 1930. On this and following pages are presented a variety of maintenance ideas developed by the company.

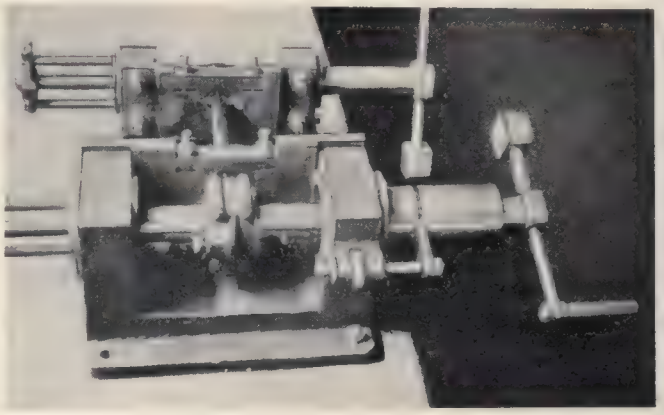
Connecting Rod Boring Tool*

BY L. ROSE
Cleveland Railway

FOR the repair and overhaul of connecting rods, the Cleveland Railway has designed a machine which is simple in operation and fast enough, in comparison with the customary shop method, to pay for itself in a short period of time. The machine consists of a body casting equipped with a sliding table. On both the body casting and sliding table are located V-type clamping plates so arranged as to permit considerable vertical adjustment and $\frac{1}{16}$-in. lateral adjustment. These V-plates are used to grip the connecting rods and are adjustable to take any standard size rod. Rods of varying lengths are accommodated by means of the sliding feature on the table. A constant length for each type rod is maintained by removable taper dowel pins through the table into the base.

Two special boring bars are used. Both bars are equipped with fly cutters and a square slot for the insertion of a two-blade Kelly reamer. The larger bar is also drilled for side cut-off in beveling tools. A large shoulder is provided on each of the bars so that cutters may be set to size and not disturbed by the removal of the bar during the boring of an entire set of rods. Provision for adjustment of side cut-off is had by means of a knurled nut and the guide which works in the groove of the large bar. This adjustment is disconnected when using fly cutters, and feed is accomplished by means of the 80 pitch screws pinned to the end of the cutter bars.

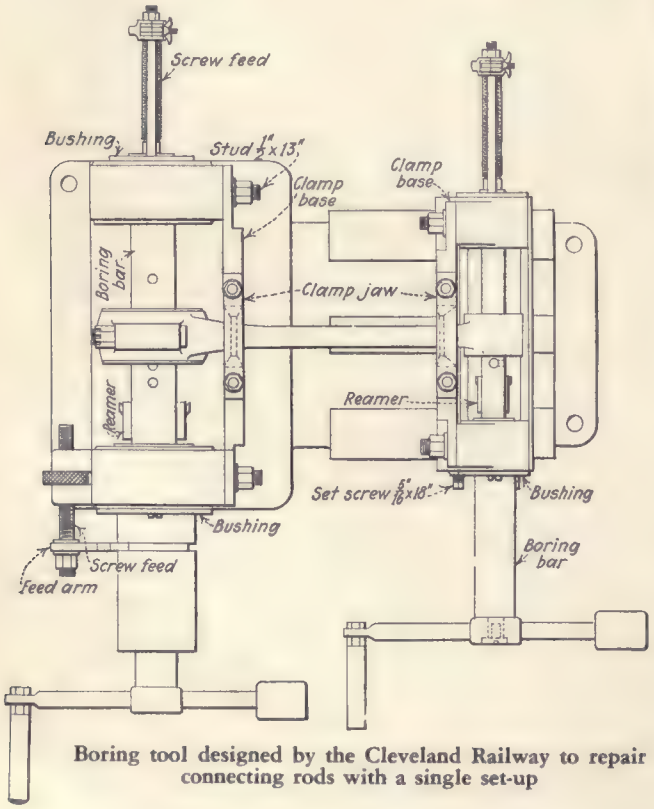
Initial location and mounting are obtained by the use of a Champion expansion mandrel which is mounted in the unbored wrist pin bushing. This centers the connecting rod in the sliding table and places it in a position at right angles to the wrist pin bushing. A height-controlling pin of a specified dimension for each type of rod is used under the larger end of the rod to locate the center accurately.



After initial adjustments have been made on this machine, an entire set of connecting rods can be bored without removal of bars

In overhauling a rod, the V blocks are disassembled, the slide adjusted to the predetermined setting and the proper height pin inserted in the base. After the rod is laid in the V, the expansion bushing is inserted and pulled up tightly. The rod is free to move laterally for centering with the large V plate. The plates are loosened so that they are free to move on the clamping nuts. The V is then tightened until a tight bearing is obtained on the rod, after which the clamping plate nuts are given a final tightening and the expansion mandrel is removed. The bar is then ready for boring.

The boring bars are next installed and through cuts to size are made in the regular manner. By using the reamers, both the rough and finishing cuts may be taken at the same time. This, however, requires accurate setting up and should be done only by skilled workmen. The amount of time involved in resetting the tool and making a finishing cut with a fly cutter after having taken the roughened cut is slight. After the bearings



Boring tool designed by the Cleveland Railway to repair connecting rods with a single set-up

*Submitted in ELECTRIC RAILWAY JOURNAL *Prize Contest.*

Developed by the Cleveland Railway

are bored, side cut-off tools are placed in the two holes provided in the larger bar and the sides of the babbitt bearing are faced and cut to the proper radius in the same operation.

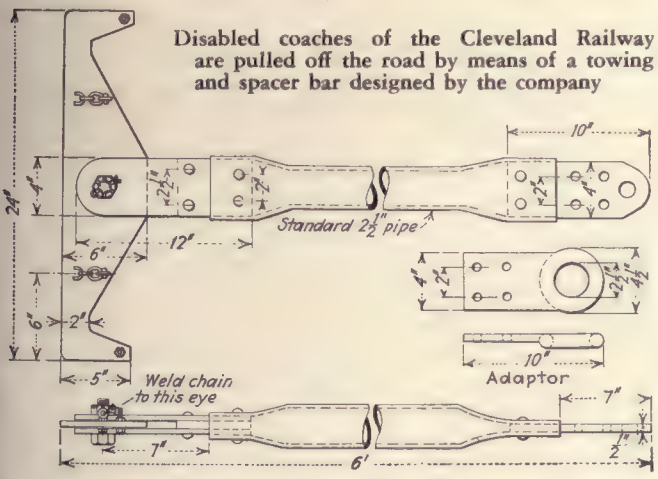
It has been found that the method of mounting described above gives practically no warping in the rod, so that the bearings which are bored parallel remain so after the rod is removed from the fixture. By clamping and boring in this manner it is not necessary to realign the bushings after machining operations have been completed.

Towing and Spacer Bar for Disabled Buses*

By William Piwonka
Engineer Cleveland Railway

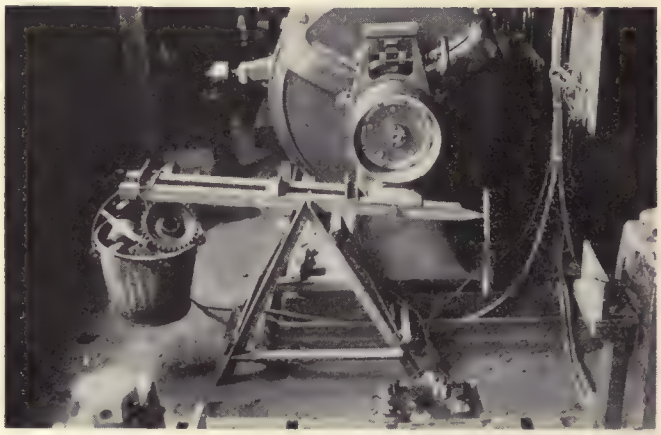
TOWING disabled coaches to their garages is of major importance where the disabled units must be removed from the road as rapidly and safely as possible. It is particularly difficult when the disabled coach is without brakes or is being run in on dummy wheels to protect a damaged rear axle. For this purpose a towing bar designed by the Cleveland Railway is being used with success. All garages of the railway will be equipped with them as standard emergency equipment.

One purpose of the design was to get a towing bar which could be rapidly and easily fastened to the bumper, front axle or front frame support member of a coach



Disabled coaches of the Cleveland Railway are pulled off the road by means of a towing and spacer bar designed by the company

or a truck. A small turning radius was also required together with a good factor of safety and ease of installation. Due to differences in the construction of various makes of coaches, the conventional clamping arrangement could not be used. To meet these requirements a pipe spacer bar is used. A swivel plate on one end is fastened to the front axle, bumper or front cross-member of the frame of the disabled vehicle by wrapping the two lengths of chain about the axle or bumper and securing them to bolts in each corner of the plate. The detachable adapter on the other end of the bar permits its use with all trucks owned by the company. No attempt was made to use the bar to steer the rear coach automatically.



Service conditions are simulated by this device for testing brake lining specimens

Brake Lining Selected by Test Results*

By Hoy Stevens
Superintendent of Maintenance Cleveland Railway

FACTORS influencing the service of brake lining for use on motor coaches have been carefully studied on the Cleveland Railway by supplementing the data obtained from actual service by laboratory tests and observations. In this manner, it has been possible to analyze the physical characteristics of the material and to judge what will happen under certain predetermined operating conditions.

The laboratory tests are made with an apparatus which consists of a brake drum mounted on one end of a dynamometer and a small stand equipped with a pivoted lever as shown in the illustration. The material to be tested is mounted on the pad which is at one end of the lever. Specimens 1 in. square are used and a thermocouple is inserted in a hole in the specimen to record the heat developed by the friction of material and brake drum. Pressure is applied by means of weights hung at one end of the lever with a 2:1 ratio of arms. In this manner, a 100 lb. weight will produce a pressure of 200 lb. per sq.in. on the brake drum when 1 sq.in. of lining is used as a test specimen. A pointer has been



Tests determine actual rate of wear of various linings

provided to indicate roughly the amount of wear, but it has been found desirable to measure this wear with a micrometer after the test is finished. Tests may be made for a large range of temperatures by regulating the flow of cooling water to a flange welded on the inside of the drum.

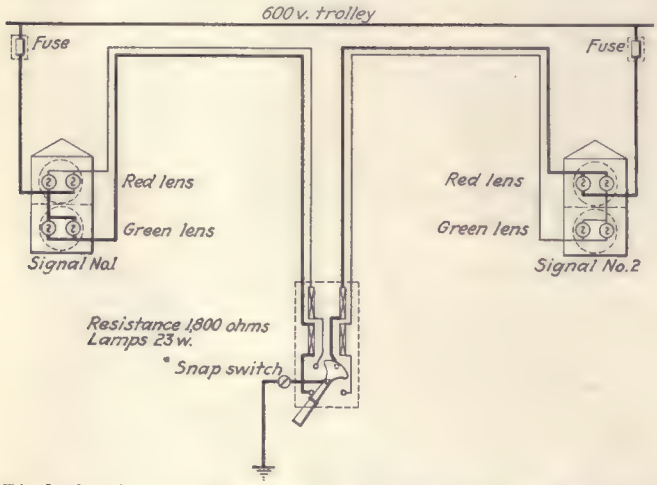
**Submitted in* Electric Railway Journal *Prize Contest.*

In testing the specimen, the coefficient of friction, and how it is affected by oil, grease or water, is determined at various temperatures. These qualities, together with the measured rate of wear, are important factors in the selection of brake lining material. For instance, in a coach where the brakes have a large factor of safety, so that the wheels can easily be locked by the operator, it may be advantageous to use a lining with a low coefficient of friction and thereby obtain greater life from the lining. On the other hand, where the braking ability is on the ragged edge it may be advisable to sacrifice lining life to increase the braking ability by using a material with a relatively high coefficient of friction.

Center Control for Temporary Block Signal*

By H. A. Brown
Foreman Return Circuit, Switch and Signal Division
Cleveland Railway

WHEN cars are operated both ways on a single track during construction jobs, the Cleveland Railway uses a single center control block signal. The signal consists of a two-color light box at each end of the track section to be controlled, together with a three-position switch placed in the middle of the block and



Block signals manually operated by a flagman in the center of the block protect tracks during construction on the Cleveland Railway lines

operated manually by a flagman. The arrangement of circuits is shown in the accompanying diagram.

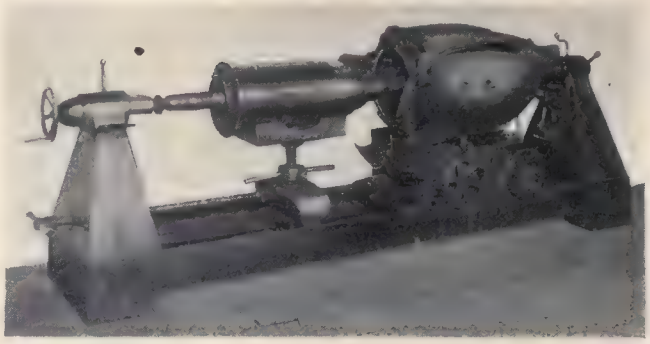
By throwing the switch to the right, a red light is displayed at one end of the block, and a green light at the other. When the switch is thrown to the left, the colors of the lights at the two ends of the block are reversed. By placing the switch in the center position, red lights are displayed at both ends of the block, enabling the flagman to control car movements if trouble occurs within the signalized area. A snap switch permits opening the circuit when the blocks are not in service.

The signals are simple and portable, so that two men may install a complete set in five hours. They replace the old methods, in which two or three men acted as flagmen, or block signals were manually operated at the end of the block by the car crews, or automatic signals were installed for use with trolley contactors.

**Submitted in* Electric Railway Journal *Prize Contest.*

Convenient Machine for Armature Removal*

By Terance Scullin
Superintendent Buildings and Equipment
Cleveland Railway



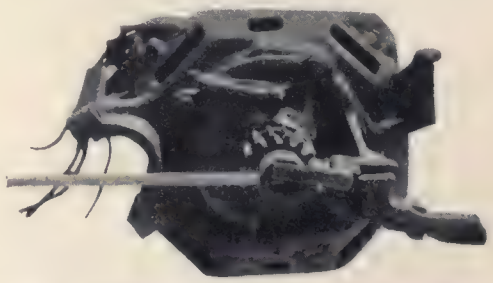
One-man machine which removes armatures from box-frame motors

ARMATURES are removed quickly and easily from motors by means of a special machine at the Harvard Shops of the Cleveland Railway. It consists of a bed with supports at both ends to hold the armature and motor box in center. Two cradles are provided, one for the motor box and another for the armature. A square thread elevator with lever attachment is used for raising and lowering the armature to and from the position of centering. The motor is placed on the motor cradle and centered. By means of two wheels the motor cradle is raised and lowered to the desired position. The motor box frame is then carried off on to the long arm of the machine and the armature cradle brought into position to receive the armature. Only one man is required for the operation.

Dog Holds Armature Pinion*

By M. J. Leary
Assistant Superintendent Buildings and Equipment
Cleveland Railway

REMOVAL or tightening of the nut holding the motor pinions on the armature shaft has been facilitated greatly by tools made at the Harvard shops of the Cleveland Railway. A special tool, shown in the illustration, is placed on the gearcase bracket after the pinion wrench has been put on the nut. The device works like a ratchet, allowing shorter bites to be taken. The device keeps the wrench from slipping off the nut, and obviates any danger of the workman's being injured. Only one man is necessary to remove or replace the pinion nut. Pre-



Ratchet dogs developed in Cleveland permit one man to remove or tighten pinion nuts without chance of injury

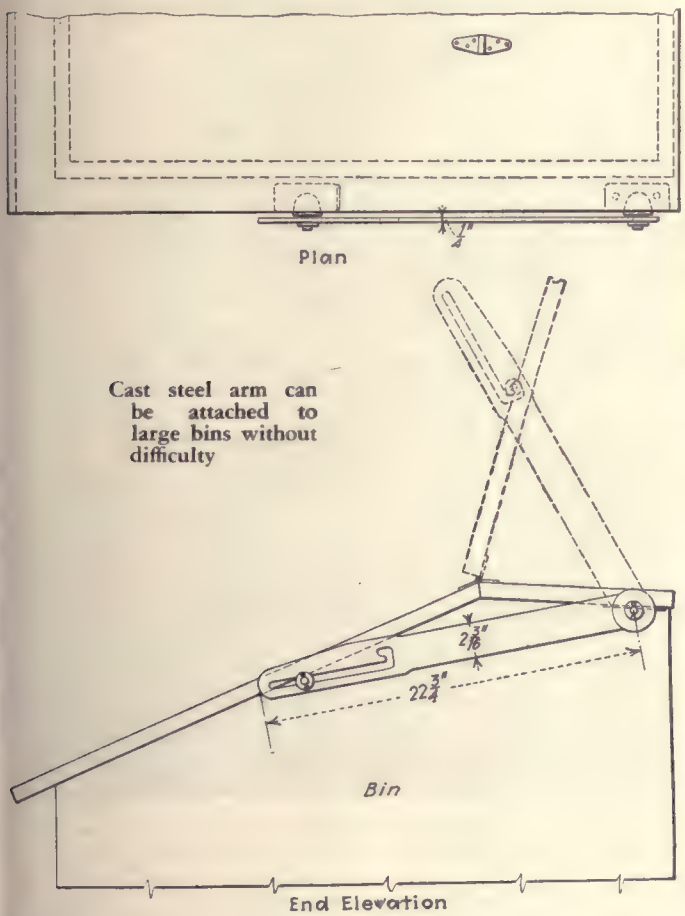
viously, an ordinary pinion nut wrench was used, pressure being placed on it by means of a long bar. One man held the bar, while another tried to keep the wrench from slipping off. This method was awkward. Frequently the wrench would slip off, and the bar would fall on a man and injure him. Both right and left-hand dogs are made up, so that they can be used for loosening or tightening the pinion nuts. The cost of the two is approximately $5.

Safety Arm for Coal and Sand Bin Lids*

By Joseph App
Mechanical Department Cleveland Railway

SAND and coal supply bins are located at the ends of the various lines of the Cleveland Railway. These boxes have large heavy lids which, when opened, rest in an almost vertical position against an upright on the back of the box. A sudden wind has on several occasions slammed this lid shut, injuring a trainman.

To prevent the unexpected slamming of these lids, a safety arm has been designed which locks them open. It

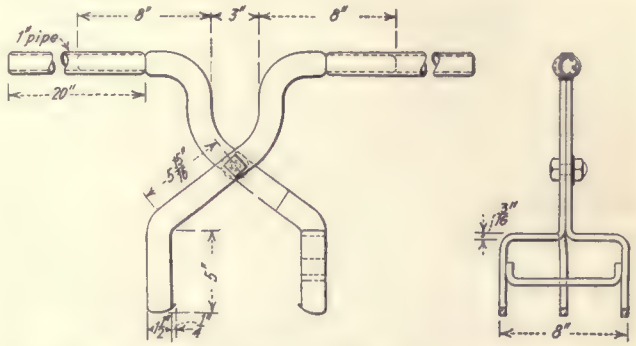


Cast steel arm can be attached to large bins without difficulty

consists of a steel casting, $22\frac{3}{4}$x$2\frac{1}{2}$x$\frac{1}{4}$ in. with an 8-in. L-shaped slot near one end. The slot allows free movement of a pivot of cast steel which is fastened to the lid. The other end is pivoted at the side and near the back of the box. When the lid is raised the lid pivot slides back to the foot of the L-slot to a depression which locks the lid securely in the open position. To shut the lid, it is necessary only to work the pivot back into the slide by a slight movement of the lid.

Treated Ties Safely Handled*

By R. B. Evans
Assistant Superintendent of Construction Cleveland Railway



Three point grip is obtained without penetrating below the treated depth of tie



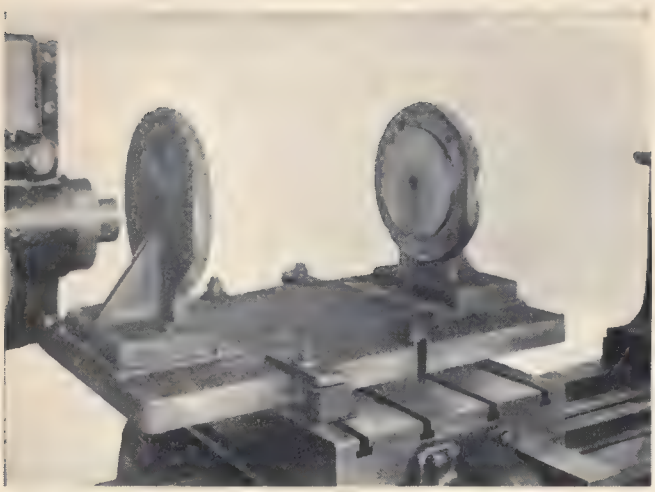
Tongs enable two men to handle tie with ease and affords greater protection against skin irritation

GREATER facility in the handling of ties has been obtained on the Cleveland Railway by the use of tongs which have been cheaply made in the shop. The tongs have three prongs, two of which grip the tie on one side and the third on the opposite side, making it easy for two men to balance the weight. The tongs are made of cold-rolled steel, and are joined at the pivot point by a $\frac{5}{8}$-in. bolt. The handles are of ordinary 1-in. wrought-iron pipe to which the ends of the tongs are forged and welded. The wood is gripped by stub points which do not enter far enough to pass through the treated zone and yet they are sufficiently deep to permit a firm grip without danger of the tie slipping from the tong.

The use of this tool has materially speeded up the handling of treated ties and has made it possible for two men to handle them with safety. Another advantage in the handling of treated ties with tongs lies in reducing the danger of sore eyes and skin irritations caused by contact with the creosote.

The danger of skin irritation to men handling ties in a storage yard is a serious one and one which affects to a large extent the speed with which ties may be piled. By greatly reducing this danger the men will go about the work with a greater freedom of action.

*Submitted in Electric Railway Journal *Prize Contest.*



This device holds a motor shell in position for boring out the axle bearing seats

Simplified Boring of Motor Axle Bearing Seats*

By John Greer
Assistant Foreman Mechanical Department
Cleveland Railway

SAVING of nearly four-fifths of the time required to set up a motor shell for boring out the axle bearing seats was accomplished by a jig designed and built in the Harvard Shops of the Cleveland Railway. The jig consists of a bedplate and two sliding vertical ends. The latter have holes spaced the same as those in the ends of the motor shell for attachment of the end housings.

After the motor frame has been built up by welding it is lifted in place by means of a crane and bolted to the jig. It is then ready for the reboring after 2½ hours work, whereas by the old method 12 hours were necessary. The cost of the jig was $55.

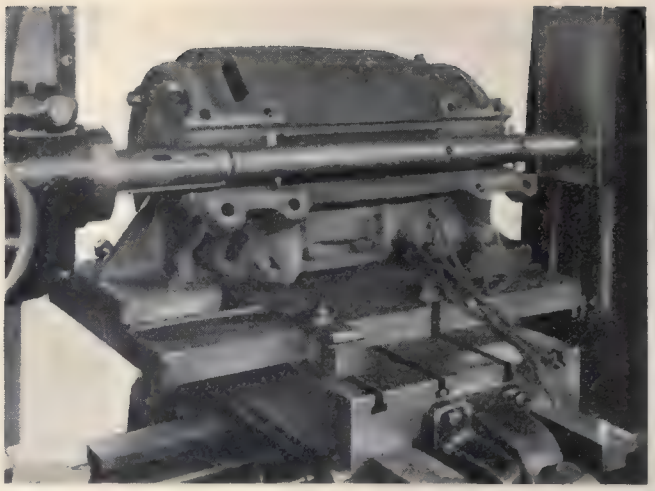
Two-faced Compass Determines Motor Field Polarity*

By R. Dumke
Foreman Mechanical Department
Cleveland Railway

POLARITY of motor fields is tested at the Harvard shops of the Cleveland Railway by a specially constructed compass. When the field polarity of the motors of a car over the pit must be determined, the simplest method is by means of an ordinary compass. As there is only one open face it is difficult and, in some positions, impossible to see the compass. The special compass was made with glass on both faces, so that it can be viewed from any angle. The center spindle which supports the needle is held in place by a single narrow brace soldered to the rim.



Compass with glass on both sides makes it easy to determine motor field polarity in Cleveland Railway shops

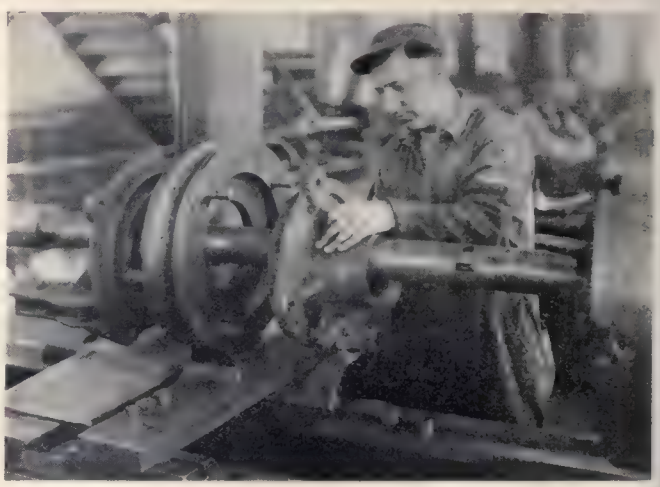


A motor in place ready for boring in the jig designed by the Cleveland Railway

Oversize Bearing Housings Bored in Jig*

By Martin F. Niederst
Foreman Mechanical Department
Cleveland Railway

FOR boring armature bearing housings which have become worn in service, and in which oversize bearings must be used, the Cleveland Railway has designed and built a jig, which is used in the Harvard shops.



By use of a special jig developed by the Cleveland Railway two end housings may be bored at once

The jig consists essentially of a ring with studs located in positions similar to those of the motor shell, so that the housings for the two ends of the motor can be bored out at once, thus insuring that the bearings will be in line.

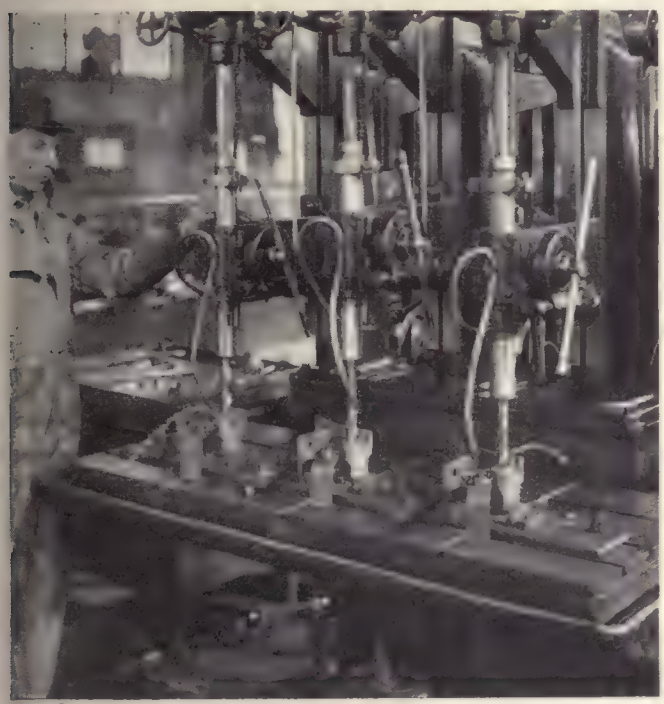
Use of the jig saves considerable time in making the set-up, and since under the old method the housings were bored one at a time it was difficult to line up the bearings. In addition, the method saves considerable time and labor. The cost of the jig was about $35.

**Submitted in Electric Railway Journal Prize Contest.*

Ingenious Jig Speeds Brake Head Drilling*

By Martin F. Niederst
Foreman Mechanical Department
Cleveland Railway

BRAKE heads are drilled at the Harvard shops of the Cleveland Railway in an ingenious jig developed by the mechanical department. This jig comprises a set of clamps so arranged that three brake heads can be placed in position for immediate drilling. A workman can insert one brake head in the first space of the jig and start this drill; then he can do the same for the other



Three brake heads are drilled progressively in one jig in the Cleveland Railway shops

two drills in turn. By the time the third head is clamped in place the first one is completed and he can start over again with drill number one. In this manner he is able to drill brake heads continuously. With the aid of this jig, one man can do three times the work done under the old method of drilling. The approximate cost of one of these jigs is $12.50.

Cylinder Boring Device for Air Compressor*

By Ray C. Sohl
Chief Engineer Cleveland Railway

FOR boring worn cylinders of air compressors, which are to be rebrushed, a jig has been designed and built at the Harvard shops of the Cleveland Railway. It consists of a short cylindrical casting, the face plate of which has holes drilled in the same relative positions as those on the compressor body casting. The latter is bolted in place on the jig, and is held securely in position. The base plate of the milling machine is fitted with



Milling machine fitted with jig to facilitate boring of compressor cylinders

keyways and locations for the studs to hold the jig firmly in position.

By means of this jig the boring can be done more accurately, and, at the same time, handling is reduced to a minimum.

Blinker Light Protects Linemen on Night Work*

By Christ Reinker
General Foreman Mechanical Department
Cleveland Railway

PROTECTION of linemen while working at night on the Cleveland Railway system is afforded by a blinker light designed and built in the shops. A sheet metal hood fitted with red glass is supported on a telescopic pipe stand with a heavy cast iron base. With a series of holes and a key, the light may be set at any desired height, or the stand may be collapsed into a small space for transportation on the truck. Five 110-volt, 23-watt Mazda lamps are connected in series, one socket being fitted with a Diamond flasher button. This device can be lighted directly from the trolley, and with its flashing red light is an effective warning to approaching traffic. The hood is inclosed on the top and four sides, so that it is entirely weatherproof. The bottom is open, affording good ventilation and making replacement of burned-out lamps an easy matter. While simple in design, the appearance is attractive. The lamps and stand are readily portable. It cost about $7 to make.



Linemen in Cleveland are protected by this flasher which shows an intermittent red light

*Submitted in Electric Railway Journal Prize Contest.

NEW PRODUCTS for the Railways' Use

Trolley Wheel Lubricated With Composition Washer

IMPROVED lubrication with adequate current capacity is incorporated in the improved trolley wheel made by the Ohio Brass Company, Mansfield, Ohio. A washer of a composition of copper and graphite is now used in place of the fiber washer between the ends of the hub and the harp. The new washer is a conductor of electricity, whereas that formerly used acted as an insulator.

Most of the current now passes from the hub to the harp through the washer instead of through the



Lubricating washers conduct current around axle from trolley wheel hub to harp

axle, thus eliminating the possibility of pitting the axle. In addition to its conducting quality, this new washer acts as a lubricant, reducing wear and, to a large extent, eliminating end play in the wheel.

The harp is designed to protect the flanges of the wheel from damage when a flying trolley pole strikes a cross span or bridge structure.

Switch Heater Supplied With Gas Fuel

SWITCH heaters for melting snow and ice, using gas as fuel and ignited from one central point, have been recently announced by the Chausse Oil Burner Company of Elkhart, Ind. The gas, either artificial or natural, can be turned on and ignited from one point, such as a signal tower. This eliminates all manual requirements for starting switch heaters and offers a centrally controlled equipment which can be operated at a low cost.



Remote control of igniter and fuel supply is an attractive feature of new switch heater

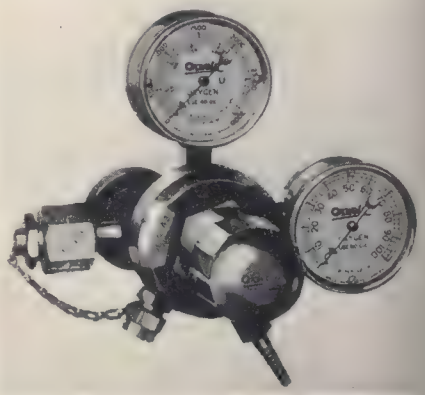
The switch heaters are 14 ft. long, placed close to the ball of the rail, and are held in position by substantial malleable-iron clamps which are attached to the ties. Gas is admitted at the center of the heater and distributed through a specially designed combustion chamber. Practically no flame is visible and consequently there is no interference with low switch targets. An igniter of michrome wire wound on a lava spool is attached at the center in a substantial steel housing and connected with the central operating switch. These heaters normally consume about 75 cu.ft. of gas per hour and the igniter is rated at 220 watts. During severe storms the heater can be left turned on constantly at a very low expense, or it can be left on for a few minutes in starting and then periodically switched on by the tower man. The rail is kept at a temperature well above the melting point of snow and ice but not sufficiently hot to affect its texture. Actually, there is sufficient heat rising above the track to melt the snow before it reaches the rail and consequently there is a path, a foot wide, on each side of the rail free of snow. The heat is sufficient to prevent accumulation of ice, and at times will keep clear the entire area between the rails. It can be successfully used on remote control crossings provided there is a source of domestic gas near by.

Pressure Regulator for Oxy-Acetylene Apparatus

FREEDOM from fluctuation of acetylene gas pressure is obtained by means of a two-stage pressure reduction device recently introduced by the Oxweld Acetylene Company. This two-stage reduction is accomplished through two separate and independent sets of diaphragms, valves and springs. The full cylinder pressure of 2,000 lb. enters the regulator through a stem-type valve and is controlled by the first stage diaphragm. In this stage, the pressure is reduced to less than 250 lb. per sq.in. This pressure will be constant for any one regulator, but varies somewhat with different regulators. The pressure here is non-adjustable.

The oxygen then passes from this first reduction assembly to a second stem-type valve and a diaphragm assembly where the pressure is reduced to the working pressure desired by the operator. This pressure is regulated by the operator by means of the adjusting screw.

Instead of the usual handle-type pressure-adjusting screw found on all other Oxweld regulators, there



Oxygen regulator equipped with a gage for tank pressure and a gage for working pressure

has been substituted a screw with a ribbed cap. The claim for this change in external design is not only a neater and more compact appearance, but also the avoidance of possibility of breakage as there are no projections on the handle to be bent accidentally. This new type adjusting screw is of smaller diameter than the body of the regulator itself, so that it is easier to pack for moving.



The new Fargo bus has been designed for compactness and speed. The power plant extends within the body and the driver sits at the left of the engine

Fargo 8-Cylinder Bus Placed on Market

RADICAL departures from standard construction are found in two new models just brought out by the Fargo Motor Corporation of Detroit. the recently organized bus and truck division of the Chrysler Corporation. While these units are to take the place of the former Dodge line of buses, and incorporate some of the features contained in it, they represent an entirely new design.

Perhaps the most striking change is the appearance of the front, which has been so shaped as to reduce wind resistance. The hood is shortened and has been rounded, with a gradual taper to meet the side panels. The windshield is tilted to meet the curve of the roof. The same body and chassis are used for a parlor car type and a city service type bus. The two, however, have different finish and appointments.



A broad, curved hood and inclined windshield have been adopted to reduce wind resistance

The engine is an 8-cylinder, L-head model, adapted for bus service from the Chrysler Imperial engine. It is mounted on a chassis built with 10x$\frac{3}{16}$-in. hot-rolled steel channels, with six cross members. Specifications of the engine and equipment are given in an accompanying table.

On account of the shortened hood the power plant has been extended



The depressed baggage space on top is reached by a substantial ladder

backward within the body. The driver's seat has been placed alongside the engine, and the steering wheel is mounted well forward on the frame. All controls, except the horn button, which is on the steering post, are on the dash directly in front of the driver. A door in the dash gives access to the engine from inside the body, while hoods at the front can be raised to uncover the fan, generator and belt drive.

An unusual feature is that by taking off the hood, uncoupling the universal joint, gear shift lever and control wires, only four caps surrounding the lugs on the engine need be removed so that the engine can be slid forward on supporting rails and lifted from the chassis by a crane.

Moving the driver forward gives 20 in. additional length inside the body for passengers and permits wider spacing of seats, particularly at the wheelhouse. Being at the extreme left, the driver is in a better position for driving in traffic and there is more room for passenger movement in and out of the bus.

Two distinct bodies are included in the line. The parlor car has seats for 21 passengers, with four additional



Accessibility to the engine is obtained by a door at the right of the driver's seat. The entire power plant can also be slid forward readily and removed with a crane

aisle seats available. The interior finish is modernistic, the motif being carried throughout. An overhead baggage rack extends the length of the bus on either side. An aluminum alloy rail at the edge acts as a hand rail. In addition, there is an outside luggage loft recessed into the roof, which is reached by a ladder at the back end.

The city type bus also has 21 seats, but they are spaced on 29½-in. centers to provide greater standing room, making it possible to carry a considerably greater rush-hour load than usual. Doors are of the double jackknife type, folding inward. A rear exit door is placed behind the rear axle. Both doors are operated by





At left—Wide seat centers and individual reclining chairs give comfort on the parlor car. At right—The city type bus has been arranged to give a seating capacity of 21 with a 22-in. aisle to carry a large standing load

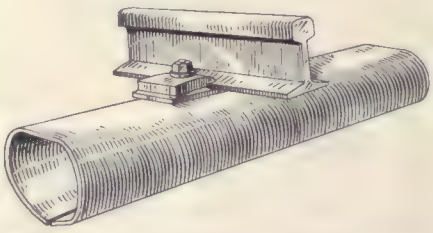
vacuum engines controlled by the driver through a four-position lever control valve. In order to compensate for standing passenger load in the city type bus, there is a helper type spring of seven leaves, 20x3 in.

The windshield has two windows, set at an angle of 170 deg., and tilted back at 31 deg., these angles being selected to reduce wind resistance and eliminate glare. The rear body panel is full visioned, with the corners made of curved glass. The body sills and posts are oak, with joints glued, screwed and leaded. Exterior panels are of sheet steel. The front body panels are of formed steel, and the headlamps are set flush. The radiator opening is circular, inclosing a standard square core of the fin-and-tube type.

Specifications of New Fargo Bus

Engine	Imperial Chrysler type, eight cylinders, "L" head
Bore and stroke, in	3½ x 5
Piston displacement, cu.in.	384.84
N.A.C.C. rating, hp.	39.2
Maximum rating, hp.	120 at 3,000 r.p.m.
Maximum torque, ft.-lb.	262 at 1,200-1,300 r.p.m.
Compression ratio	5:1
Main bearings	Nine with 112.31 sq.in. total surface
Weights, lb.:	
Chassis	7,500
Parlor car, complete	12,000
City type, complete	11,500
Parlor car, per seat	572
City type, per seat	547
Carburetor	Stromberg DD-3 dual
Fuel pump	AC
Radiator	Fin-and-tube type
Capacity cooling system, gal.	10½
Ignition	Delco-Remy, 12-volt automatic advance
Generator	North-east, 12 volts, 400-500 watts
Battery	Six cells, seventeen plates each, 160 amp.-hr.
Clutch	Single-plate dry disc, 15 in. diameter
Transmission	Four speeds forward, S.A.E. standard shift
Rear axle	Full floating, Timken-Clark underslung worm drive
Gear ratio, final drive	6.2:1
Front axle	I-beam section, reverse Elliott type
Chassis springs	Semi-elliptic, silico-manganese steel, thirteen leaves
Spring dimensions, in.	Front, 44 x 3; rear, 60 x 3½
Wheelbase, in.	172
Chassis lubrication	Myers magazine oilers on shackles and bushings
Brakes, service	Hydraulic internal expanding with BK vacuum booster
Brake drums	Gun iron, front, 16 x 3 in.; rear, 17½ x 4
Total braking area	416.125 sq.in.
Parking brake	Double ventilated disk on propeller shaft, 14 in. diameter
Steering gear	Worm and sector, varying 20:1 ratio
Turning radius	27 ft.
Inside width	90¾ in. at seat cushions
Inside height	78 in. at aisle
Length	247 in.
Parlor car body:	
Seats	21 on 33-in. and 40-in. centers
Type of seats	Kelton Aurand three-position recliners, 37 in. wide
Ventilators	Four Nichols-Lintern
Window curtains	Fabrikoid
Baggage rack	Plymetl, ¼-in.
Side panels	Plymetl, with rub rail at floor height
Roof	Haskelite, formed sections
City type body:	
Seats	21 on 29½-in. centers
Type of seats	Dodge
Ventilators	Three Nichols-Lintern
Aisle width	22 in

Elliptical Steel Tie



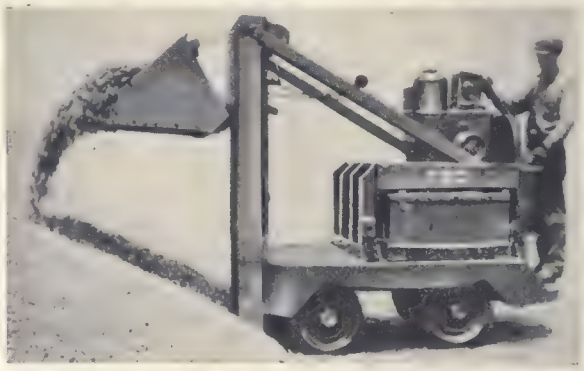
Elliptical steel tie developed in Germany

NUMEROUS advantages over previous types of steel ties are claimed for an elliptical design developed by Richard Scheibe, Dresden, Germany. This tie is made of sheet iron bent to the general shape of an ellipse with a longitudinal slot at the bottom. Rails are fastened to the tie by clips and bolts which pass through the upper surface of the iron. For electric operation, insulating material is introduced between the rail and the tie. It is claimed that the elasticity of the elliptical shape prevents the loosening of the rail fastenings in service. Tests have been made by dropping a hammer, weighing 42 kg., from a height of 1.2 meters. Under 67,000 blows, the rail fastenings were loosened in only three of twenty tests. Another advantage claimed for this tie is that heat of the sun's rays on the rail is dissipated quickly in hot weather.

Shovel Truck for Bulk Material

FOR handling bulk material of all kinds, a small four-wheel drive shovel truck has been designed by the Terminal Engineering Company, New York, N. Y. While the small size of the truck makes it suitable for work inside a box car, it can dig and carry 1-ton loads. Because of the four-wheel drive these machines have a large tractive effort for pushing their shovels into a pile of bulk material. Their traveling speed is 10 m.p.h. empty and 8 m.p.h. loaded.

Shovel buckets are made in varying widths for handling materials of different specific gravities. A single hoist unit controls all the functions of the bucket. An automatic stop on the upstroke speeds up the operations on short-haul work and acts as a safeguard. The uprights on which a shovel carriage runs may be built to any desired height. The turning radius is short because all four wheels steer.



The large tractive effort that is obtained from the four-wheel drive enables this truck to nose into a pile of bulk material

NEWS *of the Industry*

LATE NEWS

Brooklyn, N. Y.—The service bureau of the Transit Commission has recommended the granting of the application of the Brooklyn & Queens Transit Corporation, to place one-man surface cars on eight lines in Brooklyn and Queens.

✦

Jacksonville, Fla.—The proposed new franchise for the Jacksonville Traction Company is being revamped to include certain things agreed to at a conference held several weeks ago between members of the special franchise committee of City Council and Peter O. Knight, counsel for the Stone & Webster interests. Meanwhile, the committee and the company are awaiting a report from engineers named to determine how much money will be required to rehabilitate the property.

✦

St. Louis, Mo.—To provide greater comfort for its night passengers, Illinois Terminal Railroad System has installed, on its electric line between St. Louis and Peoria, the latest improvement in travel service—the new single bedroom sleeping cars. There are nine single rooms in each car all equipped with suite arrangement. Each room contains a large bed, toilet facilities, folding writing table, upholstered chair, electric fan, ample lighting arrangement.

✦

Michigan City, Ind. — South Shore Line shippers are now provided with direct interchange facilities with the Pennsylvania Railroad. With completion of the electric overhead work early in September, the interchange, located west of Gary, is now ready for service.

✦

San Francisco, Cal. — The Board of Supervisors on Sept. 19 voted to submit to the people a charter amendment extending the franchise of the Market Street Railway 25 years. It was an obligatory step, sufficient signatures to a petition to have the amendment put on the ballot having been obtained.

✦

Brooklyn, N. Y. — The Brooklyn & Queens Transit Corporation, after successful operation of trolley buses, has filed a petition for extension of the Cortelyou Road line through Flatbush section to New Utrecht Avenue.

✦

Albany, Ore.—Rails will be laid on the new Oregon Electric extension east of Lebanon before 1931, W. F. Turner, president, and A. J. Witchell, chief engineer of the Spokane, Portland & Seattle and Oregon Electric railroads, said on Sept. 17 before leaving for Portland following an inspection trip over the new construction work.

✦

Camden, N. J.—New records were established for carrying bus passengers to seashore resorts in the Southern division, Public Service Co-ordinated Transport, over the Labor Day week-end. More than 35,000 passengers were hauled without an accident.

(Late News Continued on Page 656)

Additional Time Needed for Toledo Grant Revamping

Negotiations looking to a revamping of the Milner service-at-cost ordinance in Toledo, Ohio, have reached a deadlock. The board of street railway control has indicated that sufficient time is not available in which to go over the franchise carefully, and recommends renewal of the Milner grant for two years. Provisions for such renewal are contained in the ordinance.

Company officials have suggested that the Community Traction Company be awarded an exclusive franchise for the rest of the time under the present grant, and have offered in exchange flexible fare provisions to give school children a 5-cent fare, permit or weekly passes and other special fares designed to stimulate riding.

Board of control members recommended several fundamental changes in a letter to Mayor W. T. Jackson on April 24. They suggested scaling down the capital value because of the $2,500,000 abandonments, refinancing of preferred stock at 7 per cent, a change to make the sinking fund dependent upon earnings rather than a recapture of capital as claimed at present, power to the board to authorize extensions of bus service, and authority for the commissioner to approve all contracts. The board sees no way out of the $812,000 accrued debt due to the deficit in the stabilizing fund, on which no interest is being charged for ten years.

August Earnings Off

Three steps are open to the city in the matter now: (1) Renewal for any period up to ten years; (2) substitution of a remodeled ordinance; (3) amortization of the property over the next fifteen years as provided by the present ordinance. Renewal could be considered later during this amortization period. To renew or revamp the ordinance requires a vote of the electors.

Total revenue of the Community Traction Company, Toledo, Ohio, in August was $215,358, the lowest point reached for several years. This represented a drop of about $80,000 under the similar month of last year. Operating costs were reduced about $29,000. After all charges in keeping with the Milner ordinance, the deficit charged to the stabilizing fund was $63,003. All individual car lines showed losses but two of the bus lines showed a slight profit. The new Maumee Valley belt line showed a slight loss. The railway ratio of expense to operating revenue was 88.418 per cent and the coach ratio 96.977 per cent. In first eight months in Toledo 28,969,941 passengers were carried compared with 36,232,810 for the similar period last year.

COMING MEETINGS

Sept. 29-Oct. 4—National Safety Council Convention, Pittsburgh.

Oct. 6-11—Sixth International Road Congress, Washington.

Oct. 9-11—Midwest Electric Railway Association, Miami, Okla.

Oct. 22-24—National Transportation Meeting of the Society of Automotive Engineers, Pittsburgh, Pa.

Oct. 29-30—Iowa Electric Railway Association, Des Moines, Iowa.

Nov. 12-15—National Association of Railroad and Public Utility Commissioners, annual meeting, Charleston, S. C.

Ticket Plan in Effect a Year in St. Louis

Results of the first year of the use of weekly commutation tickets by the St. Louis Public Service Company show that the average fare for ticket riders was only 7½ cents or less than the prevailing rate of fare when the ticket system was put into effect in August, 1929.

During the year more than 7,500,000 tickets were sold and an average of fifteen rides was taken on each ticket. The total rides, including 5-cent fares of ticket riders, were 115,928,699.

When the ticket plan went into effect on Aug. 26, 1929, the first twelve rides were 90 cents and each additional ride in any week 5 cents. After eighteen weeks trial, the cost of tickets was raised to $1 with extra rides at 5 cents. During the year 27,000,000 5-cent rides were taken by ticket holders, or an average of 3.52 rides per ticket sold. The progress of the plan through the years has been recorded in the Journal from time to time.

Supreme Court Refuses Kansas City Fare Stay

Chief Justice Hughes at Washington, D. C., on Sept. 20 refused to issue an order restraining the Kansas City Public Service Company from putting into effect an increase from 8 to 10 cents in fares. Final determination of the case awaits an appeal now pending before the court. The Kansas City Public Service Company succeeded in having a higher schedule of rates approved by the Public Service Commission of Missouri. The city took the case to a Circuit Court, which issued a temporary restraining order. The company appealed to the Supreme Court of Missouri, which held that the Circuit Court had no jurisdiction. The case was appealed, but in the meantime the city, through Marty K. Brown, Jr., sought the stay.

LATE NEWS

(Continued from Page 655)

Toledo, Ohio—The Community Traction Company has rerouted its Maumee Valley line, an interurban coach loop, so that it will abandon the Miami Street feeder line on the east side and transfer part of the operation of the Beverly feeder line to take in a new territory in Heather Downs district.

✦

Philadelphia, Pa. — Business men of South Philadelphia have now informed William S. Vare that unless the City Council appropriates funds to extend the Broad Street subway to navy yard they will take part in a "rebellion" against the Republican organization. Mr. Vare assures them that the project has his personal approval.

✦

Birmingham, Ala. — By agreement with the city, the Birmingham Electric Company will substitute buses for its street railway line from Woodlawn to Irondale. The city agreed to the change in order to obtain the electric company's right-of-way for a paved highway. Transfers will be issued on the bus line without charge. The Birmingham Electric operates only one other bus line, the Avenue F line.

✦

Louisville, Ky.—The Louisville Railway is arranging to operate more one-man cars. The Preston, Main and Eighteenth Street line, and the Portland and Shelby Street line, using double-truck two-man cars, were to go to single operator methods, the former on Sept. 18, and the latter on Oct. 5. In addition, one-man cars were to be placed in operation after 6:30 each evening on the Bardstown Road, the Second Street and the Market Street lines.

✦

New York, N. Y.—It is not regarded as likely that any statement on the Interborough Rapid Transit Company's policy on unification will be issued until after the organization meeting of the new board of directors, Sept. 30.

✦

St. Louis, Mo. — The taxable valuations of Missouri public utilities have been increased $10,905,453 by the State Tax Commission. The new total is $504,613,191 compared with $493,770,738 fixed by the State Board of Equalization in 1929. Street and electric railways are valued at $62,756,086, compared with $61,802,001. The utilities may appear before the board between Sept. 17 and 26 to protect their valuations.

✦

Richmond, Va. — The Virginia State Corporation Commission has taken under advisement the complaint of citizens of Petersburg and Hopewell that additional bus service should be rendered by the Southside Transportation Company. The Petersburg, Hopewell & City Point Electric Railway is opposing the proposal to extend the bus service.

✦

New York, N. Y.—Thomas I. Parkinson has been renominated by directors of Manhattan Railway to succeed himself on the board of directors of the Interborough Rapid Transit Company for a term of three years, as a representative of the Manhattan Railway.

Wheeling, W. Va.—Trainmen of the Wheeling Traction Company have defeated a proposal of a six-day working week, three to one. The plan was set forth simultaneously with the announcement of a schedule change by the railway which cut one run from the Martins Ferry-Rayland division and sheared one from the Barton division after 6:45 p.m. Trainmen are now working eight days and resting the ninth.

✦

Seattle, Wash.—No further transfers to the Seattle & Rainier Valley Railway line will be issued Sundays to children who ride the cars and buses of the Municipal Railway on school tokens. Sunday school cards and fares will be accepted as usual, however. The Sunday transfer privileges for all children of school age were arranged between the two systems for the duration of the school vacation period only.

✦

Memphis, Tenn.—The Memphis Street Railway has offered to Mayor Overton and the City Commission a bus line from Poplar and Cooper, out Poplar to Highland Street, down Highland to Central, in Central, past the new Fairview High School, to East Parkway, down the Parkway to Young Avenue, on Young to Cooper, and north to the starting point. Buses would run both ways all day, with extra buses during school hours. Fare would be 10 cents, with a transfer to any of the five street car lines free, and 3 cents when transferring from a street car to a bus. The company did not ask for a franchise but for an opportunity to try out the new service.

✦

New York, N. Y.—The Interborough Rapid Transit Company has served notice on the Transit Commission that it will ask the Supreme Court to set aside an order issued on Sept. 4 requiring the company to show cause why a mandamus order should not be issued compelling it to obey the Transit Commission's demand that it purchase 289 new cars and extend station platforms at Spring and Canal Streets on east side line.

✦

Baltimore, Md. — Smoking is being permitted on the new cars of the United Railways & Electric Company. And a cigar maker has replied to this concession by advertising that the particular kind of rope sold previously by him at 10 cents has been reduced to 5 cents for each length. Which has reminded one commentator of Shakespeare's immortal words: "Ingratitude, thou marble-hearted friend."

You Will Want to Tune In

ON Wednesday evening, Oct. 1, Old Counselor, speaking for Halsey, Stuart & Company, will broadcast a talk on the electric railways, over the National Broadcasting chain of 37 stations.

Philadelphia, Pa.—Probably the largest suburban station in the United States for electrified train operation will be opened here on Sept. 28 by the Pennsylvania Railroad. It will be located under the city's new Broad Street Station Building at Sixteenth Street and Pennsylvania Boulevard. The new station will accommodate all of the railroad's suburban service operating in and out of Philadelphia, involving a total of 325 electric trains daily. These trains now use Broad Street Station. Approximately 30,000 Philadelphia commuters will use the new facilities daily.

✦

Oklahoma City, Okla.—Rejection of the Oklahoma Railway's unofficial offer to remove its belt line embankment from Northwest Park if the city would pay for the work has been ordered by the city park board, members of which said they believed the Council had no right to grant a right-of-way on property dedicated for park purposes without the board's consent.

✦

Vancouver, B. C.—Despite fewer passengers carried by the British Columbia Electric Railway for the year ended June 30, the total revenue from the passenger transportation system shows a slight increase over that of last year. The greatest decrease is shown in the freight business of the company. Much of the revenue from this branch results from the interchange with various transcontinental systems, and the drop shown in freight traffic of these systems is reflected in B. C. Electric returns. Depression in the lumber industry also contributed to the decline.

✦

Columbus, Ohio—The Columbus Railway, Power & Light Company has asked the Public Utilities Commission for permission to abandon its lines to Minerva Park. A hearing is set for Oct. 28. The commission authorized the company to discontinue service on the line from Minerva Park to Westerville in December. The petition states that for fifteen years the company has suffered large annual deficits as the result of the service. The company is willing to start bus service to Minerva Park from the north corporation line on Cleveland Avenue.

✦

Philadelphia, Pa.—Dr. A. A. Mitten, president of Mitten Management, has contributed to the September issue of *Executives Service Bulletin,* published by the Metropolitan Life Insurance Company, an article in which he describes the background of his organization's recent comprehensive survey of Philadelphia traffic conditions and the measures which were recommended for their relief.

✦

Newark, N. J.—A radio receiving set and a refrigerator are features of the equipment of a new, luxuriously appointed motor coach completed in the Newark shops of Public Service Coordinated Transport for use in its special and chartered bus service. The new coach has the same chassis and the same modern body design as the company's new super-service type buses, but it is equipped with swivel chairs, upholstered in richly colored velour. A special glass-inclosed compartment has also been built around the operator's seat to insure greater privacy for the passengers.

(Late News Continued on Page 660)

Montreal Tramway to Help Defray Tunnel Cost

The Montreal Tramways, Montreal Que., has agree to pay one-third of the cost of the proposed $2,500,000 tunnel beneath Lachine Canal at Wellington Street. The city will approach the federal government immediately to obtain government assistance in the cost of construction. It is hoped that a referendum may be submitted before the end of November.

The Wellington Street tunnel would replace the bridge which now carries street railway lines and vehicular traffic over the canal. Traffic is particularly heavy at this point, and the tunnel would provide direct and easy access to Verdun and other sections of the city across the Lachine Canal.

At the meeting of the city representatives, the Montreal Tramways Commission and the Montreal Tramways, a similar tunnel to cross the canal in Cote St. Paul was also considered favorably, but the project will not be pressed for the present.

New Rates in Washington Benefit Railways

A. G. Neal, comptroller of the Washington Railway & Electric Company, says the operating report of the company for July has been misconstrued. According to the figures actually reported to the Public Utilities Commission, a decrease of 78 per cent in income is shown for July, 1930, over July, 1929. Mr. Neal explained, however, that a difference in crediting a rental item would make the decrease only 30 per cent over July of last year.

Utility experts who have examined the July operating report of the Capital Traction Company have expressed the opinion that, as in the case of the Washington Railway & Electric Company, bookkeeping methods make the decline in income over July, 1929, seem more than is actually the case. The net income of the Capital Traction Company for July is about 50 per cent below the corresponding month last year, it is stated, instead of 78 per cent as indicated by the figures.

Despite the losses in income which have resulted mainly from unrestricted taxicab completition, the inreased rates in Washington have benefited the railways. It is estimated that the companies are taking in approximately $1,000 more a day than they would have received had the old rates prevailed. From reports filed at the commission, it is shown that the 35-cent flat fare cabs are losing money. The announced intention of the commission to regulate cabs is expected to have a salutary effect in reducing the number of these vehicles.

Novel Merchandising Plan Conducted in Cincinnati

"SAVE half enough to buy your evening theater tickets by riding street cars. This is R.K.O. month." With this text, an interesting co-operative advertising plan was developed in Cincinnati during August by six Radio-Keith-Orpheum theaters and the Cincinnati Street Railway. The plan was developed through a desire on the part of the amusement people to advance the normal opening of the theater season from Sept. 1 to Aug. 1, and on the part of the railway to promote greater use of street cars in the evening.

Bills of exceptional merit were arranged at all the R.K.O. theaters. Large three-color posters, 22x28 in., were carried on all street cars, featuring the theaters and the railway service. These posters showed a strip of car tickets in one corner and a bunch of theater tickets in the opposite lower corner. The poster read, "Save by riding street cars—see more shows." Posters inside the cars carried usual street car messages. These included a special corner postscript advertisement, emphasized in red, calling further attention to the use of street cars for attending evening theaters. The back of the Sunday pass for Aug. 17 was also used for the plan.

The price of admission for evening shows ranges from 30 cents to 50 cents. With the usual charge for parking of 30 cents to 50 cents and the cost of driving a car, it was shown to be possible to save at least the cost of one ticket by using the street car.

In return for the advertising carried on the street cars, the R.K.O. Corporation carried in all of its houses a two-minute news reel, featuring the advantages of street car service for attending the theater. The street car film opened with the announcement, "Cincinnati's street cars spring a new one, observing R.K.O. month," and then showed familiar street scenes with the company's street cars in service. Other captions in the film were: "There are 350,000 car riders daily," "Shoppers leave early for return to evening shows," and "R.K.O. theaters are conveniently located near car lines."

The six R.K.O. theaters give eight shows daily with an estimated attendance of 2,000 persons each performance. This means that the film was favorably presented 336 times during the week before an estimated audience of 672,000 people. Details of the plan were developed by William E. Danziger, of the R.K.O. Corporation, Hudson Biery, director of public relations of the Cincinnati Street Railway, and Clarence E. Runey, motion picture producer.

The news film showed many points of interest in Cincinnati and featured the operation of street cars. In addition three-color posters, 22x28 in., were carried on the dash of the street cars during the campaign







Bondholders Oppose Receiver's Certificates to Meet Expenses

Proposals by Elmer W. Stout, receiver of the Terre Haute, Indianapolis & Eastern Traction Company and three leased lines, to give operating expenses preference over mortgage bond obligations were opposed on Sept. 15 by attorneys for the bondholders at a hearing before Judge Joseph M. Milner of the State Superior Court in Indianapolis.

The three lines involved are the Indianapolis & Martinsville Rapid Transit Company, the Indianapolis & Northwestern Traction Company and the Indianapolis, Crawfordsville & Danville Electric Railway, having an aggregate trackage of 164 miles.

The bondholders' attorneys announced opposition to any course which would tend to reduce the equities of the bondholders in the properties, declaring bondholders agreed with the suggestion of the Midland United Company, which recently offered to purchase the bonds of the T.H.I.&E., that operation of the leased lines should be discontinued at once.

On Aug. 20, the Midland United Company, an Insull holding company, made a subsequent offer to the bondholders' committees of the three leased companies, agreeing to purchase the first mortgage bonds at about 20 per cent of face value, or a price equivalent to the salvage value of the lines plus the value of the power business conducted by them. The bonds have been selling on the open market for from 10 to 15 cents on the dollar.

On Sept. 5, Mr. Stout, the receiver for the T.H.I.&E., filed a report with the court, announcing his decision not to continue operation of the three leased lines as part of the T.H.I.&E. receivership, because of deficits in operation. Two days later, Mr. Stout was appointed receiver for each of the three companies.

On Sept. 13, the receiver asked the court for permission to borrow money from the receivership fund of the T.H.I.&E. which would become a prior lien to first mortgage obligations in order to pay deficits and continue operation of the three separate lines. This served to force the issue of whether it would be to their bondholders' advantage to continue the lines with money obtained from warrants superior to their first mortgage rights. Mr. Stout knew of no way to finance the operation other than through receiver's certificates.

Judge Milner has taken the petition under advisement.

Omaha to Vote on Bridge Bond Issue

At the November election to be held in Omaha, Neb., the citizens will vote on the question of issuing bonds for erecting a free bridge between Omaha and Council Bluffs, Iowa, to take the place of the present toll bridge owned and operated by the Omaha & Council Bluffs Street Railway.

If the decision is favorable for the free bridge, it will be a virtual repudiation of the gift by the railway of its bridge under an escrow agreement whereby the two cities are to receive the bridge free as soon as the company's price of $4,155,296 is received in tolls. The estimated time for realizing this price is 6½ years from date of the gift, Oct. 31, 1929. This time has now been cut to 5 years and 9 months.

Under the escrow agreement, the title to the bridge is being held by six Omaha and Council Bluffs men and cannot be revoked by the railway. However, the agreement provides that it will automatically be revoked if construction of a new bridge is begun within a mile of the present structure (the only logical place for a new bridge), or if condemnation proceedings are started against the present bridge.

The free bridge advocates consider the company's price of $4,155,296 for the bridge too high.

Improvement Bonds for Chicago "L" Approved

The Chicago Rapid Transit Company has been authorized by the Illinois Commerce Commission to issue $7,160,000 in two-year gold notes to provide funds for improvements. The notes are to be sold for not less than 96 per cent of par and are to bear interest not in excess of 6 per cent. They may be retired before maturity on 30 days' notice. The present plan is to refund this indebtedness when the surface and the elevated lines are consolidated. In the plea to the commission to issue the notes, the company made it plain that approval of the issue would enable improvements to be started at once, made necessary by the new franchise settlement ordinance.

Well-Rounded Program for Miami Mid-West Meeting

An elaborate program of papers and an inclusive carnival of entertainment for both the delegates and the ladies have been arranged for the annual meeting of the Midwest Electric Railway Association at Miami, Okla., on Oct. 9, 10 and 11. The program of papers follows:

OCT. 9

10 a.m.—"Welcome to Miami"—Rev. Willmore Kendall, introduced by W. L. Rush, Mayor of Miami.

Response — President H. S. Robertson, president Denver Tramway.

"The Trackless Trolley"—F. M. Peters, district manager, transportation department, General Electric Company, Chicago.

12:30 p.m.—Round table luncheon.

2:30 p.m.—"Small-City Operation"—F. J. Johnson, railway engineer St. Joseph Railway, Light, Heat & Power Company.

First aid demonstration—NEO team.

Address—J. F. Owens, vice-president and general manager Oklahoma Gas & Electric Company.

6:30 p.m.—Banquet, Rockdale Country Club.

Address—W. L. Crittenden, chairman speakers bureau Oklahoma Utilities Association.

OCT. 10

9:30 a.m. — "Electric Transportation Equipment for Present Day Operating Requirements"—S. B. Cooper, manager, general engineering department, Westinghouse Company, East Pittsburgh, Pa.

"Manufacturers' Hour" — Five-minute talks by supply representatives on developments, or on any other matter of interest.

12:30 p.m.—Round table luncheon.

2:30 p.m.—Joint session with Mid-West Claims Association.

"Solicited Claims"—G. T. Hellmuth, general claims attorney Chicago, North Shore & Milwaukee Railroad.

Address, "This Road Is Not Foolproof"—John E. Curtis, former chairman Nebraska State Railway Commission.

For hotel reservations write to H. B. Cobban, general manager of the Northeast Oklahoma Railway, Miami, Okla.

Consideration of Service-at-Cost Grant Postponed

Portland's service-at-cost franchise as proposed by the city's consulting engineers, Carey & Harlan, has been tabled and no part of the several ramifications of it requiring acquiescence of the voters of the Oregon city will appear on the ballot at the November election. This was the decision of the City Council after a second hearing on the proposed franchise on Sept. 16.

Reasons advanced by the Council for not attempting to whip the ordinance into shape at this time so as to be able to place it before the people in November were: (1) that there is insufficient time between now and election to inform the people fully as to the proposed provisions; (2) that if the proposition should be placed on the November ballot it would become a football of political controversy with the effect of obscuring the economic issues involved.

Counter proposals offered were, first, that the city offer the company $1 for tracks and pavements instead of $3,900,000 suggested in the Carey & Harlan plan, and second, that a straight 5-cent carfare be placed in effect with the city reimbursing the company out of taxes for such losses as would inevitably occur.

The next hearing on the ordinance is scheduled for Nov. 15. In the meantime it is expected that a settlement of present difficulties may be effected at informal conferences between the city's engineers and officers of the company so that the final franchise presented to the people for approval will be one that the company can accept. It is possible that the franchise may be presented before the people at some special election next year.

Baltimore Revenue Off 8.12 Per Cent in August

Revenue passengers of the United Railways & Electric Company of Baltimore declined 17.39 per cent as compared with August, 1929, according to Lucius S. Storrs, president. This is in proportion very close to the decline for this August of all the railroads in the eastern territory, so that it may be said to reflect pretty accurately the depressed business conditions and unemployment in the section.

The United's decline in gross receipts was considerably less than that of other companies, Mr. Storrs said, being only 8.12 per cent as compared with August of last year. This was due to the fare increase granted early in the year. The decline in revenue passengers this August was not due alone to depressed business conditions, but reflected also the effects of the extremely hot weather.

The final showing of the company under all circumstances is good, the president declared. The net income declined only $15,291.64 as compared with August, 1929, reflecting economies along all lines which the management was able to put into effect without interfering with the service, with decline in car-miles of only 5.29 per cent. Condensed operating figures are given in the monthly statistics on page 643 of this issue.

It is pointed out that the net result is that the United shows a smaller decrease in earnings than any railway in the country serving a comparable population where an increase of fare has not taken place.

What's in "News of the Industry"

Terms of city purchase of Philadelphia Rapid Transit actively discussed.

Luxuriously fitted bus for chartered service in New Jersey.

No hope for revamping service-at-cost now in Toledo.

Illinois Terminal installs single bedroom sleeping cars.

Gas-electrics, new cars and merchandising considered at Maryland meeting.

Fitting memorial to memory of George Westinghouse.

Economic week mad with alarms.

Third Avenue cuts its adjustment income payment.

Five-cent fare vote in San Francisco.

Maine hitch-hiking law effective.

Brill sales hold up well.

Details of New Haven's new electric locomotives.

Copper prices lowest in 30 years.

Piedmont extension case again before court.

Taxi regulation still agitates Seattle.

Good will broadcast at San Antonio effective.

More bus routes for Memphis.

Comprehensive study of parking problem in Washington with concrete suggestions for relief.

Large suburban station to be opened in Philadelphia.

Tunnel expenditure approved for Montreal.

Jacksonville still at work on new franchise.

More one-man lines for Louisville.

President Storrs explains Baltimore August figures.

Effective merchandising stunt in Cincinnati.

Electric railways subject of broadcast Oct. 1.

Ticket plan in St. Louis on trial one year.

Portland plan to be considered later.

Many attractive papers on Mid-West program.

Washington companies benefit by new rate.

Smoking permitted on Baltimore's new cars.

Parking and Garage Problem Studied at Washington, D. C.

Believing that the automobile terminal problem challenges the best constructive efforts of those who are responsible for community development; that it can be solved economically and effectively only on the basis of adequate facts, and that henceforth building and city planning must take cognizance of the implications of the parking and garage problem if serious consequences are to be avoided, the Automobile Parking Committee at Washington, D. C., has completed an extensive engineering survey on this subject, and submitted a detailed report of its findings, together with definite conclusions and recommendations.

The technical work for this committee was conducted by the staff of the National Capital Park and Planning Commission, under the supervision of Charles W. Eliot, 2d, director of planning for the commission. Dr. Miller McClintock, director of the Albert Russell Erskine Bureau of Harvard University, consultant to the commission, organized the survey, analyzed materials, and drafted the formal conclusions and recommendations.

Facts about the central business district developed by the survey revealed that future development of governmental areas, and a more intensive use of commercial land areas within the central district will greatly increase the automobile terminal problem. An analysis indicated that the demand for parking exceeds the effective supply of such facilities, and that additional provision must be made if this form of transportation is to develop. The relation of parking to business and to the transportation of government employees was carefully analyzed. It was definitely determined that parking regulations should be based on business needs, with as great liberality as is consistent with necessary freedom of movement and equitable provision of available facilities.

A summary of the general recommendations submitted by the committee follows:

Angle parking should be eliminated, as the 25 per cent reduction in capacity on the few streets where it is now permitted will be more than compensated for by greater regularity of parking and traffic movement.

The provision permitting double parking should be repealed, and a strict prohibition substituted. Loading zones should be freely established with a special provision that they may be occupied by waiting private cars in charge of a driver, when the zone is not required for loading or unloading.

One-hour parking limits should be continued in the congested districts as defined in the official regulations. One-hour limits should also be applied to any business district in the city.

A two-hour parking limit should be applied in the district immediately surrounding the present congested districts.

Within a period of two years all-night parking at any place in the city should be prohibited.

To reduce the number of all-day parkers it is recommended that parking be prohibited between 8 and 9:30 a.m. in the more congested part of the business area.

The final conclusions arrived at as a result of this survey are as follows:

It is safe to say that the eventual solution of the parking problem is not to be found along the streets, and, indeed, present conditions are such as to warrant immediate attention to alternative and more efficient terminal facilities.

While parking restrictions or prohibitions beyond those reasonably required for current use should not be used to force abnormal garage construction, a definite indication of the willingness to apply reasonable restrictions and a recognition of the ultimate need to prohibit when traffic requirements justify, should have a very stimulating effect upon private garage enterprises.

Provision of garage facilities through the self-contained block plan should in no manner discourage individual property owners from the construction of commercial garages, or the builders of office or other buildings from evolving plans to incorporate garage facilities as an integral part of their structures.

No structure should be built in downtown Washington without adequate provision for the off-street handling of commercial movement.

Garage facilities should be provided for storage space of approximately 1,000 cars in each of five buildings composing the triangle group of Federal buildings.

If the proposed garage construction is undertaken, rates should be adequate to cover operating charges.

The Business Outlook

A MAD week from start to finish, mad with alarms, plots and rumors, governmental and private, brought into play or used by professional bears as a final desperate resort to squeeze the last drop of profit out of the short side of financial and commodity markets. This sort of thing is usual in the last stage of deflation, when prices have discounted all possible further business decline and are beginning to respond to the forces of recovery. Such forces are obviously though still feebly at work, but the rate of improvement is too slow to warrant expectation of return to normal levels in the few remaining months of this year, without more vigorous Federal Reserve action and militant business leadership.

—*The Business Week.*

Two Ohio Lines Suspend

Two of Toledo's oldest interurbans, the Toledo, Bowling Green & Southern and the Toledo, Fostoria & Findlay will cease operation on Oct. 1 under authority granted by the Ohio Public Utilities Commission. On application of the Cleveland Trust Company, trustee, C. C. Fernsell, Dover, has been named receiver for the Toledo, Fostoria & Findlay line. Service on this road was stopped for a day when the Lake Erie Power Company, supplying energy for a section of the line shut off the power because of an unpaid bill of $5,000. Representatives of the Western Ohio Railway & Power Company, said the abandonment of the T.F.&F. line would force the Western Ohio lines out of business. The latter connects Piqua, Lima and Findlay.

Memorial to Be Dedicated Oct. 6 to Westinghouse

Dedication of the memorial to George Westinghouse, inventor and founder of the vast industries which bear his name, will take place on Oct. 6. Invitations are now being sent to leaders of industry, science, art and education to attend the dedication as guests of honor and pay tribute to the genius who conceived the air brake, developed the steam turbine and was the proponent of alternating current, and, as well, created industrial structures to provide the world with the benefits of these vital engineering developments.

The ceremony will include the dedication and unveiling of a bronze group of heroic proportions created by Daniel Chester French, America's foremost sculptor. A banquet will be tendered to the invited guests in the evening.

The construction of the memorial and its dedication is in charge of a board of trustees consisting of the men who captain the Westinghouse industries. Erection of the memorial was made possible by appropriation and subscriptions among 60,000 employees of Westinghouse industries in the United States and other countries. Its location will be the most beautiful spot of Schenley Park, Pittsburgh.

Mr. French created the center unit of the memorial and the companion piece—the American youth. Henry Hornbostel designed the setting for the memorial. The Piccarelli brothers constructed the models of the various units for casting. Paul Fjeldi designed the six panels depicting the great achievements of Mr. Westinghouse. The main unit rises 20 ft. from a Norwegian granite base. It includes a dominating figure of Mr. Westinghouse in the prime of his life. Flanking him are two figures depicting a skilled workman and an engineer typical of the thousands of artisans who assisted the master in his work. Facing this group on a separate pedestal is a figure of American youth modeled in an inspired attitude as he studies the monument of achievement.



Memorial to memory of George Westinghouse in Schenley Park

Balanced Development Needed for Rapid Transit

The planning of future rapid transit lines so as to create, in the more open areas of New York City, important new business and residential centers entirely independent of the congested midtown Manhattan sections, is urged by the Regional Plan of New York in a report made public on Sept. 27. Decentralization, brought about by transit, zoning and planning, is seen as the only means of avoiding overbuilding and the stifling of circulation in the old centers.

This report, on the relation between building bulks and transit, covers one of a series of studies being prepared by the Regional Plan staff as part of the final volume of its surveys of the metropolitan New York region, which have been under way during the past seven years.

The report points out that the construction of new transit lines to the already overcrowded centers, instead of relieving the congestion in these centers, would "add to the congestion by giving new facilities to extend and maintain it." By utilizing new lines to build up undeveloped parts of the city, however, public authorities would promote balanced development.

LATE NEWS

(*Continued from Page 656*)

New York, N. Y.—The Third Avenue Railway has declared a semi-annual interest payment of 1¼ per cent on the $22,536,000 5 per cent adjustment income bonds payable on Oct. 1. The bonds have been on a 2½ per cent annual basis since 1924. After the October payment arrearages will total 35¼ per cent.

✦

Saskatoon, Sask.—Extensive development of the railway system owned by the city is under consideration by the City Council. It is proposed to establish a shorter route to the Sutherland district, to establish railway service to University Heights subdivision over 25th Street bridge and to extend the services on Avenue L. Extension of services along Twelfth Street east to Albert Avenue and on Albert south to Eighth Street are also under consideration.

✦

New York, N. Y.—The Transit Commission engineers testify that it would cost $6,000,000 extra to build the city's proposed Sixth Avenue subway with the present elevated structure of the Manhattan Railway left standing.

✦

Nashville, Tenn.—A petition asking that the Nashville Railway & Light Company be required to furnish the Nashville Interurban Railway with the current necessary for its operation, has been filed in Part II of Chancery Court before Chancellor James B. Newman. The case involves interpretation of the terms of a contract for power entered into between the companies in 1915.

✦

San Francisco, Cal. — Voters of San Francisco will in November pass on the advisability of the continuation of the 5-cent fare for the municipal railway, it appeared after unanimous approval of the proposal by the judiciary committee of the supervisors. However, action upon the proposed amendment to the city charter to fix the rate definitely has been deferred to determine the need for a clause to utilize a tax subsidy in the event of a deficit.

✦

Portland, Me. — General James W. Hanson, chief of highway police of Maine, writing in the *United States Daily*, says that the Maine anti-hitchhiking law has been effective and is a deterrent to the very great nuisance of soliciting transportation from passing motorists. Prior to its becoming effective on July 13, 1929, the law was well advertised through the press to the people of the state. Police records do not show a single case of prosecution for violation of this act since it was passed.

✦

New York, N. Y.—Herman A. Metz, who has been asked by the Transit Commission to resign his post as a director of the Interborough Rapid Transit Company, to permit the substitution of a man "more sympathetic toward the commission's policies," stated that he submitted the request to the I.R.T. board and they told him "unanimously to stick." Mr. Metz also said that "if the city's unification plan is something I cannot conscientiously support as fair dealing, it will be time for me to resign, and I will quit then."

✦

Corning, N. Y.—Five cars formerly in service on the Elmira, Corning & Waverly Traction Company's line, discontinued some time ago, have been transferred into cottages of three rooms each by the operator of a camping ground at Lake Lamoka, where they are now in use.

Maryland Operators Discuss Many of the Latest Developments

Cruising down Chesapeake Bay, the members of the Maryland Utilities Association held an enjoyable meeting on Sept. 11-12. The steamer *City of Atlanta*, chartered by the association, provided facilities for the meetings of the transportation, electric and gas groups which were held Wednesday evening and Thursday morning.

At the evening meeting of the transportation group, the chairman, Adrian Hughes, Jr., superintendent of bus transportation United Railways & Electric Company of Baltimore, introduced J. C. Thirlwall of the General Electric Company, who told of trends in urban transportation. Mr. Thirlwall illustrated his various points by means of talking movies, in particular the development of light-weight railway motors and modern cars.

Friday morning's meeting was devoted to a general discussion of car and bus equipment for city and intercity service, under the leadership of Mr. Hughes. Mr. Thirlwall discussed the action of the magnetic brake. The effect is proportionally more on a "greasy" rail than on a clean, dry rail, he said, as there is no reduction in magnetic pull due to rail condition.

That where high rates of acceleration and braking are used it is necessary to have additional supports for passengers, such as stanchions and grab handles, was the opinion of several speakers, including A. T. Clark and D. J. Locke, of the United Railways & Electric Company, Baltimore.

Improvements in equipment demand an entirely new operating technique, according to Mr. Locke. The men must be specially trained to run the new type of vehicle successfully. Operators must understand that they have a vehicle that can be stopped as quickly as a rubber-tired one.

Mr. Hughes compared the results of modern double-deck gas-electric buses of large capacity with old types they had replaced. The new buses make a faster schedule since the design is better, and rapid automatic acceleration is possible. This change has brought new riders.

Labert St. Clair, director of advertising, American Electric Railway Association, warned against making new cars too good, since then they do not wear out, and it is difficult to make replacements before they are entirely obsolete. He also spoke briefly of the results obtained with the 2-cent fare for short-distance riders in Cleveland between the Public Square and Eighteenth Street. At present four times as many passengers are being carried as formerly with an 8-cent fare. There is no reason, believes Mr. St. Clair, why transportation cannot be sold in bulk like electric or gas service, perhaps on a credit basis. This plan preferably should be handled by means of a house-to-house canvass.

At Jamestown, Va., an hour was spent inspecting the ruins of the first English settlement in America. Another stop was made at Yorktown. There golf, bathing, and a bus trip to see historic points in that town and in Williamsburg were the attractions for the delegates. In the evening dancing and bridge were enjoyed.

Conspectus of Indexes for September, 1930

Compiled for Publication in ELECTRIC RAILWAY JOURNAL by

ALBERT S. RICHEY

Electric Railway Engineer, Worcester, Mass.

	Latest	Month Ago	Year Ago	Last Five Years	
				High	Low
Street Railway Fares* 1913 = 4.84	Sept., 1930 **7.99**	Aug., 1930 **7.99**	Sept., 1929 **7.76**	Aug., 1930 **7.99**	Sept., 1925 **7.29**
Electric Railway Materials* 1913 = 100	Sept., 1930 **133.0**	Aug., 1930 **134.2**	Sept., 1929 **146.1**	Dec., 1926 **159.2**	Sept., 1930 **133.0**
Electric Railway Wages* 1913 = 100	Sept., 1930 **231.8**	Aug., 1930 **231.8**	Sept., 1929 **231.0**	Aug., 1930 **231.8**	Sept., 1925 **222.7**
Electric Ry. Construction Cost Am. Elec. Ry. Assn. 1913 = 100	Sept., 1930 **195.6**	Aug., 1930 **196.1**	Sept., 1929 **203.4**	Nov., 1928 **205.7**	Sept., 1930 **195.6**
General Construction Cost Eng'g News-Record 1913 = 100	Sept., 1930 **199.6**	Aug., 1930 **201.0**	Sept., 1929 **207.6**	Jan., 1927 **211.5**	Sept., 1930 **199.6**
Wholesale Commodities U. S. Bur. Lab. Stat. 1926 = 100	Aug., 1930 **84.0**	July, 1930 **84.0**	Aug., 1929 **97.7**	Nov., 1925 **104.5**	July, 1930 **84.0**
Wholesale Commodities Bradstreet 1913 = 9.21	Sept., 1930 **10.42**	Aug., 1930 **10.45**	Sept., 1929 **12.67**	Dec., 1925 **14.41**	Sept., 1930 **10.42**
Retail Food U. S. Bur. Labor Stat. 1913 = 100	Aug., 1930 **143.7**	July, 1930 **144.0**	Aug., 1929 **160.2**	Nov., 1925 **167.1**	Aug., 1930 **143.7**
Cost of Living Nat. Ind. Conf. Bd. 1914 = 100	Aug., 1930 **151.6**	July, 1930 **152.4**	Aug., 1929 **162.9**	Nov., 1925 **171.8**	Aug., 1930 **151.6**
Industrial Activity Elec. World, kw.-hr. used 1923-25 = 100	Aug., 1930 **105.3**	July, 1930 **105.1**	Aug., 1929 **128.2**	Feb., 1929 **140.4**	Aug., 1925 **94.3**
Bank Clearings Outside N. Y. City 1926 = 100	Aug., 1930 **86.9**	July, 1930 **91.6**	Aug., 1929 **111.7**	Oct., 1929 **111.8**	Aug., 1930 **86.9**
Business Failures Number	Aug., 1930 1630	July, 1930 1930	Aug., 1929 1350	June, 1930 1874	Sept., 1928 1348
Liabilities, Millions of Dollars	**57.06**	**72.21**	**35.63**	**114.40**	**23.13**

*The three index numbers marked with an asterisk are computed by Mr. Richey, as follows: Fares index is average street railway fare in all United States cities with a population of 50,000 or over except New York City, and weighted according to population. Street Railway Materials index is relative average price of materials (including fuel) used in street railway operation and maintenance, weighted according to average use of such materials. Wages index is relative average maximum hourly wage of motormen, conductors and operators on 136 of the largest street and interurban railways operated in the United States, weighted according to the number of such men employed on these roads.

Late T. E. Mitten Large P. R. T. Holder

Although published reports of inventory of the late Thomas E. Mitten's estate filed with register of wills showed holdings of only 10 shares of Philadelphia Rapid Transit stock, Dr. A. A. Mitten declares that his father's investment in Philadelphia Rapid Transit stock actually consisted of 20,000 shares. A more careful inspection of the inventory will show, he pointed out, that this stock is held by holding companies, in which his father owned all of the capital stock. Value of the total estate was $3,527,184 according to the inventory filed by the executors. The largest single investment was $1,902,261 in Mitten Management, Inc.

Purchase by City Discussed

The consensus of opinion of members of the transit conference at Philadelphia, Pa., as expressed at the meeting on Sept. 17, was that a special appraisal of the Philadelphia Rapid Transit Company and the underliers should be made, in line with the movement of the conference to bring about purchase by the city.

In discussing the proposed project, Deputy City Comptroller Wilson pointed out that the most the city could be expected to pay was from $130,000,000 to $150,000,000. He stressed the necessity of quicker action by the conference, stating that the city's borrowing capacity was at the present time insufficient to meet the need of the city for further improvement and municipal projects planned. He contended that purchase of the transportation system would increase the city's borrowing capacity by from $100,000,000 to $130,000,000.

Mitten Management pledged to the conference complete co-operation in making the proposed appraisal of P. R. T. property. Moreover, the conference was assured that earnings of P. R. T. for 1930 would be more than sufficient to meet common and preferred dividend requirements.

Louisville Curtails Its Advertising Activities

James P. Barnes, president of the Louisville Railway, Louisville, Ky., has announced the discontinuance of the publicity department of the company and the position of publicity director, held by Earl D. Hale.

Regret was expressed by Mr. Barnes at the step, made necessary, he said, by the continued loss in passenger revenue which compels the company to curtail every activity not directly relating to operation of the system. Mr. Barnes said:

"It is a matter of grave regret to the management that at the present time we are forced to stop all our advertising activities. Personally, I regard this as a backward step which we are forced to take in view of the exigencies of the situation. Mr. Hale has more than fulfilled our expectations as the publicity director of our company, and I am sorry that present conditions make it necessary for us to discontinue his department."

PERSONAL MENTION

Walter J. Cummings Made a Brill Officer

Railway Executive and Manufacturer With Wide Experience in Both Sides of Local Transportation Industry in New Affiliation With Great Potentialities

WALTER J. CUMMINGS, president of the Cummings Car & Coach Company, Chicago, Ill., was elected a director and vice-president of the J. G. Brill Company, at a meeting of the Brill board on Sept. 9. Mr. Cummings will be in charge of Brill's Western division and will make his headquarters in Chicago.

In a statement issued at that time Samuel M. Curwen, president of the Brill Company, and Mr. Cummings expressed the belief there is a distinct tendency toward an improvement in the future railway business



W. J. Cummings

and that a large quantity of new rolling stock will be purchased within the next few years.

Never has Mr. Cummings been anything less than enthusiastic about the future of local transportation. His ardent belief in that future was perhaps best expressed in an interview published in ELECTRIC RAILWAY JOURNAL for March 27, 1926. He has steadfastly held that the essential nature of the service rendered made the position of the electric railway fundamentally sound. He has, however, been fully cognizant of the possibilities of the bus and of the trolley bus. He has believed that the bus added a new valuable agency for handling a type of service that did not justify railway construction and contended that bus operation by electric railways need not be a losing venture when approached from the proper viewpoint.

As was said of Mr. Cummings in the JOURNAL for Sept. 3, 1927, at the time of his election as president of the Chicago & West Towns Railway, he knows the railway business as a manufacturer and operator, senses its needs and has confidence in its future. His active interest in the industry dates back about 25 years when the successful foundry and forging business that had been built up by the Cummings brothers was expanded through the purchase of the McGuire Manufacturing Company, well-known manufacturers of trucks and sweepers. Mr. Cummings' more recent active connection with the industry has been reflected in the rehabilitation of the Des Moines City Railway under his presidency.

Mr. Cummings was born on June 24, 1879, at Springfield, Ill. His early training was in the banking business. The Chicago & West Towns Railway, over which he assumed executive control in 1927, operates 67 miles of electric railway in the section lying just west and southwest of Chicago. In addition, it owns more than 7 miles of track which are leased to the Chicago Railways. The West Towns company also operates bus lines supplementing its railway service.

Frank T. Post Heads Spokane United Railways

Frank T. Post has been elected president of the Washington Water Power Company and affiliated companies, including the Spokane United Railways, and J. E. E. Royer has been made general manager and R. B. Childs assistant general manager.

Mr. Post succeeds the late D. L. Huntington. He has been general counsel of the Washington Water Company since 1909 and a vice-president since 1926. He is the fourth president of the company since its organization in 1889. Mr. Post has been a resident of Spokane since the spring of 1889, the year of the great fire. He began practicing law at Lowville, N. Y., 43 years ago. He is the senior member of the law firm of Post & Russell.

Mr. Royer is the seventh general manager of the company, succeeding the late Miles W. Birkett. Mr. Royer entered the employ of the company in 1907, his first work being with construction crews in connection with the maintenance of power stations and substations. He was next assigned to the light and power department and in 1919 was made assistant superintendent of that department. On Nov. 1, 1924, he was appointed assistant general manager.

Mr. Childs, the new assistant general manager, has been a commercial engineer with the company since 1923. He came to the Washington Water Power Company from the Intermountain Power Company and was with the Montana Power Company previously. Mr. Childs was a captain in the 363rd infantry regiment of the 91st division during the World War.

Charles J. McMorrow, supervisor of service for the Springfield Street Railway, Springfield, Mass., for the last ten years and for 24 years an employee of the company, has resigned to become sales manager for a real estate company in Springfield.

Advancement from the Ranks in Rochester

Three advancements in the service of the New York State Railways, Rochester lines, have been announced by John F. Uffert, general manager.

John E. Greene, formerly assistant claim agent, becomes chief claim agent under the ancillary receivership of the railways and its subsidiaries, the Coordinated, Interurban and East Avenue bus lines. He has been in the company's employ for twenty years.

Promotion of John J. Sharley from claim agent to superintendent was also announced.

A. P. Griswold becomes assistant claim agent.

H. C. Elliott Promoted by Insull Interurbans

H. C. Elliott, for many years popular at Racine, Wis., as traffic agent for the "Road of Service," has assumed his new duties as general agent of the North Shore Line, Chicago, Aurora & Elgin Railroad and the Chicago, South Shore



H. C. Elliott

& South Bend Railroad, with headquarters in Chicago.

Efficient and courteous performance of duties featured the career of Mr. Elliott since he joined the North Shore Line on June 13, 1924, as information clerk in the traffic department. In September of the same year he was transferred to the transportation department, in a similar capacity. On Nov. 1, 1924, Mr. Elliott was appointed traffic agent at Kenosha. Later he was transferred to Racine, where his geniality and painstaking efforts to serve customers made many new friends for the company, resulting in his new appointment.

H. R. Erickson, traffic agent at Kenosha, has taken over Mr. Elliott's duties at Racine.

Hugh Bradley With Commonwealth & Southern

Hugh Bradley, for some time connected with the law firm of Martin, Thompson, Turner & McWhorter, at Birmingham, Ala., has accepted a position with the secretarial department of the Commonwealth & Southern Corporation, New York.

Mr. Bradley attended the University of Alabama from 1918 to 1922 receiving his A. B. degree in 1922. Following his graduation, he entered the law school and while

studying law was an instructor in the department of political science and economics.

Before finishing his law course, Mr. Bradley was awarded a Rhodes Scholarship and took up his residence at Brasenose College at Oxford University in the Fall of 1924. While at Oxford he studied jurisprudence and received his A. B. degree in this subject in 1927.

On returning from Oxford, he was employed by the University of Alabama in extension work and conducted classes in various parts of the state in both history and economics, giving up this work with the university to join the firm of Martin, Thompson, Turner & McWhorter about Sept. 1, 1928, from which he resigned to accept his new situation.

St. Louis Superintendents in New Posts

Four veteran superintendents have been transferred to new stations by the St. Louis Public Service Company. Laurence Kearns has been changed from Kossuth to Park Avenue, George F. Trotter moving into Kossuth, M. A. Hallen has taken up his new duties at South Broadway, while W. P. January is now at Jefferson and Geyer.

Mr. Kearns began his career with the company in 1909 at the Virginia and Walsh sheds. He was made a night clerk, and later assistant foreman. In 1914 he was promoted to chief clerk to the superintedent of transportation. He served one year with the American Expeditionary Forces. Two years after his return from France, he was made relief superintendent, and in 1923 he became superintendent of the Easton station, holding that post six years. In November, 1929, he was transferred to Kossuth station.

Mr. Trotter has been with the company and its predecessors for almost 40 years. He started with the Lindell Railway in 1891 and received his first promotion in 1894.

Mr. Hanlen began as a conductor on the Lee line in 1911. He has held many station office jobs and was made superintendent for the Jefferson and Geyer station in 1925. He was in France with the American forces for eighteen months.

Mr. January also started with the company in 1911. His first work was as a conductor at South Broadway. He was made night clerk a year later and then receiver at the South Broadway station. Later he became night foreman, but in 1925 he was promoted to day foreman at Newstead Station. In 1928 he became superintendent at Park Avenue.

Frank Walsh on Interborough Board

Frank Walsh, attorney, has been nominated as director of the Interborough Rapid Transit Company, New York, by the transit commission. He succeeds William W. Niles, whose three-year term has expired.

Mr. Walsh will represent the public on the Interborough Rapid Transit board. He is understood to favor unification if satisfactory terms can be reached for the city.

The new director has been a member of the American bar, specializing in public utilities, for more than 40 years. He was a member of the commission appointed by Governor Roosevelt to study the Public Service Commission Law and was co-author of the minority report.

In 1912 he was appointed by President Wilson to head a national commission on industrial and economic relations. During the war he was a member of the Labor Conference Board.

Herman A. Metz and A. E. Blackmar are the other "public" directors.

"Clint" Spurr a Bank Director

Announcement has been made of the election of A. C. Spurr, general manager of the Wheeling Traction Company, Wheeling, W. Va., to be a director of the National Exchange Bank of Wheeling.

Election of Mr. Spurr increases the National Exchange board to a membership of eleven. He brings to that body an extensive experience as a business and public utilities executive. Although he has been located in Wheeling only a few years since assuming charge of the Wheeling Traction system, Mr. Spurr has gained a commanding place in both business and civic affairs. He is a past president of the Public Utilities Association of West Virginia, a past president of Fort Henry Chapter Reserve Officers' Association, chairman of the Activities Committee of Oglebay Park and a member of the boards of directors of the Wheeling Y. M. C. A. and the State Fair Association.

H. B. Fleming Made President of Chicago City Railway

Harvey B. Fleming has been elected to succeed the late Leonard A. Busby as president of the Chicago City Railway, the Southern Street Railway and the Calumet & South Chicago Railway, all of which are parts of the Chicago Surface Lines system. Under Mr. Busby, Mr. Fleming had been vice-president of the three companies as well as chief engineer of the Surface Lines. He began his career with the Surface Lines in 1899.

Mr. Fleming was also chosen as a member of the board of operations of the Surface Lines to succeed Mr. Busby. He was likewise made a member of the executive committee of the board of operations.

Harry P. Weber, law partner of Mr. Busby, was elected vice-president and general counsel of the three companies of which Mr. Fleming is president.

Henry C. Page Retires from Worcester Street Railway

HENRY C. PAGE has retired as general manager of the Worcester Consolidated Street Railway, Worcester, Mass., a veteran railroader, battle-tried but not battle-scarred, to take a vacation "for the rest of my life." A genial spirit and a deal of a philosopher, Mr. Page will not fret and rust because he is no longer pinned to a schedule. There are fish to catch, games to play, books to be read, friends to cultivate.

As the *Worcester Telegram* so aptly put it, Mr. Page has seen about all there has been to see in the development of urban and interurban rail transportation. He began in the ranks and brought himself up to leadership. As a conductor he rode the old cars in the days when a plodding pair of horses, with an extra horse at the hills, supplied the motor power. He was on the reception committee which welcomed electricity. He served through the boom time when trolley lines simply could not be chartered, built and operated fast enough, and when President Mellen of the New Haven was acquiring them with the lavish gestures of a Rajah buying Koh-i-noors.

Under the changed economic conditions of the last decade, Mr. Page has been a really courageous fighter. For a good many years he has been getting Worcester's residents down to their jobs in the morning and back at night safely, inexpensively and on time. He knows all about blizzards and traffic snarls and labor relations and all the other things with which a trolley line operator has to perplex himself. He has worked hard and intelligently and he has enjoyed doing it. As the *Worcester Telegram* so generously said, when you come to think it over "Worcester owes something to that kind of a man."

Mr. Page began his railway career more than 45 years ago as a conductor with the Lynn & Boston Street Railway. He was rapidly promoted with this company and finally was placed in complete charge of the schedule arrangement and car dispatching. When the Boston & Northern Street Railway was formed, Mr. Page was retained by it and was promoted from time to time until he became general superintendent in charge of 405 miles of track. In this capacity he was particularly successful in handling the employees, and in his arrangement of the schedules.

In 1903 Mr. Page become general manager of the Berkshire Street Railway, Pittsfield, Mass., and remained with that company until June, 1905, when the property passed into the hands of the New York, New Haven & Hartford Railroad. At the same time the Springfield Street Railway was also taken over by the New Haven, and Mr. Page was appointed general manager of the Springfield Company. In November, 1907, he was elected vice-president of the Springfield Street Railway and continued in this capacity until September, 1909, when he was appointed general manager of the Worcester Consolidated Street Railway and affiliated companies to succeed E. G. Connette. He has served the Worcester Company continuously since that time.

E. J. Bock Supervisor of Stations for Chicago "L"

Edward J. Bock, former trainmaster at the Highwood yards of the North Shore Line, has assumed the duties of general station inspector of the Chicago Rapid Transit Lines. Before joining the "L" lines, Mr. Bock was employed with the North Shore Line for twelve years. He entered the employ of that interurban line in October, 1918, as assistant superintendent of transportation, serving in that capacity, and as superintendent of freight until Jan. 1,

1924, when he was appointed supervisor in the transportation department. On Feb. 1, 1927, he was appointed yardmaster and on Feb. 15, 1929, was named trainmaster, being employed in that capacity until shortly before his transfer to the Rapid Transit Lines.

R. C. Forman in New Stone & Webster Post

R. C. Forman, well known for his personnel work with Stone & Webster companies, has been transferred from the Virginia Electric & Power Company, Richmond, Va., to the property of the Western Public Service Company at Scottsbluff, Neb.

Mr. Forman has taught at Louisiana State and Texas Universities, has taught in several high and normal schools in Texas, has been a traveling salesman, and was teaching salesmanship and public speaking when he joined the Stone & Webster organization in Texas some years ago.



R. C. Forman

Devoting his attention to public speaking and personnel improvement work of a general nature, he has, since his affiliation with Stone & Webster, carried on his activities on many of their properties in the Southwest and the Old South. The latest scene of his endeavors has been the various properties of the Virginia Electric & Power Company, with headquarters in Richmond.

Mr. Forman is a good "mixer," and has been very popular with the personnel of every organization with which he has been associated.

He was born in Mississippi and attended Louisiana State University, where he was graduated in 1917 with an A.B. degree. Following this he engaged in post-graduate work at the University of Nashville, the University of Texas, and the University of Chicago. While attending the latter institution he took up special work in public speaking, following this with a course at the Boston School of Expression.

F. T. Whiting Westinghouse Official at Chicago

Fred T. Whiting has been appointed assistant manager of the northwestern district of the Westinghouse company under N. G. Symonds, commercial vice-president. Mr. Whiting was graduated from Iowa State College in the class of 1913, and immediately entered the apprenticeship course of the Westinghouse Machine Company. In 1915, he joined the sales department at East Pittsburgh, but was transferred to Chicago in 1917. He served in the United States Army for two years as a major in the Fifth Engineers Corps, returning to Chicago to assume his former duties. He was manager of the engineering division of his company from June, 1920, to June, 1921, and then became industrial manager, a position he occupied until his appointment as assistant manager of the northwestern district. Mr. Whiting was born and reared in Iowa.

W. Howe Sadler with Kentucky Utilities

W. Howe Sadler, Louisville, Ky., has been named by the Kentucky Utilities Company as manager of its public information, advertising departments, to direct publicity and advertising, and kindred activities, succeeding J. Earle Davis, resigned. Mr. Sadler went to Louisville four years ago from Atlanta. He started his newspaper work with the *Daily Capital*, of Topeka. He attended the University of Arkansas and Kansas University. He holds a lieutenant's commission in the 313th Cavalry, being a member of the Reserve Officers Association. With the Kentucky Utilities Company he will come in contact with railway, bus, power, ice, water, gas and various other units under the control of this large Insull organization.

W. J. (Jerry) Stanton Sells His Cuban-American Holdings

W. J. Stanton, for more than two years vice-president and treasurer of the Cuban-American Manganese Corporation, New York, has disposed of his holdings in that organization, controlling interest of the company having been purchased by the D. M. Goodrich Company.

For a number of years Mr. Stanton was employed by the General Electric Company and the Ohio Brass Company in the engineering and commercial departments and, in this capacity, traveled to all parts of the United States building up, incidentally, an extensive acquaintance among public utility executives and operators.

Mr. Stanton has made no definite arrangements for an immediate future, but it is quite probable that he will again enter the public utilities supply field, with which he has been so long associated.

C. R. Jones Promoted

The Westinghouse Electric & Manufacturing Company announces the appointment of Charles R. Jones as assistant Northeastern transportation manager.

Mr. Jones entered the employ of the Westinghouse Company shortly after he was graduated from the University of Pennsylvania. After completing the company's apprenticeship course, he was assigned to duties in the railway department at East Pittsburgh headquarters, and specialized in electric railroad work. Since 1911, he has represented the Westinghouse Company in the railroad and electric railway fields in the New York district.

George Keller, truck service engineer of the J. G. Brill Company, resigned on Aug. 15 to engage in the garage business in Philadelphia.

R. P. Tarbell in Executive Post With Welding Engineers

Ray P. Tarbell has recently become a member of the firm of Robert E. Kinkead, Inc., consulting welding engineers, Cleveland, Ohio. He was formerly Cleveland district sales manager of the Lincoln Electric Company, manufacturers of "Stable-Arc" welders and "Linc-Weld" motors.

In his new position, Mr. Tarbell will be connected with a firm which has established a national reputation as specialists in a new division of consulting engineering work. Robert E. Kinkead, Inc., serve as welding engineering consultants for large steel companies, steel fabricators and manufacturers of mechanical equipment. They also supervise the establishment of welding departments within industrial firms and direct the methods of welding procedure and control and the redesign of products for arc welded steel construction, a field in which Mr. Tarbell in his



R. P. Tarbell

former capacity has been actively engaged for many years. As vice-president and secretary, Mr. Tarbell will aid Robert E. Kinkead, well known authority on welding procedure and control, in his executive duties as president of the firm which bears his name.

Mr. Tarbell entered the employ of the Lincoln Electric Company in 1918. He was afterward promoted to the sales force and later made district sales manager of the company. He attended Dartmouth College.

Heber LaMonte Acts for Indiana Railroad Only

In the September issue of ELECTRIC RAILWAY JOURNAL, in the article regarding the change in the personnel of Indiana Railroad as successors to Union Traction Company of Indiana, there was a paragraph to the effect that "Heber LaMonte will be superintendent of motive power of the joint properties, reporting to Mr. Bucher."

This paragraph is in error. Mr. LaMonte was superintendent of motive power of the Union Traction Company, and continues as superintendent of motive power for Indiana Railroad. The paragraph just quoted would rather indicate that he had been placed in charge of the motive power departments of the different companies of the system. This is incorrect.

OBITUARY

Frank R. Ford

Frank R. Ford, a founder and member of the consulting engineering firm of Ford, Bacon & Davis, Inc., died on Sept. 17, following an operation, at the age of 59 years. Active for 39 years in the public utility and industrial engineering field, and intimately connected with electric railway problems throughout this period, the passing of Mr. Ford is a grave loss to the entire industry. Since the work of the company of which he was the head included consultation, design, valuation, reports and management of utilities and industrial enterprises which present engineering problems, Mr. Ford was a vital force in the development of American industry. Concentrating in the earlier years on the firm's activities on the planning and construction of electric railways, Mr. Ford assisted in assembling one of the most valuable collections of electric railway statistics in this country.



Frank R. Ford

Among the outstanding achievements of Mr. Ford and his associates were the reorganization of the Metropolitan Street Railway of New York City, the electrification and unification of railway lines in New Orleans, management of the Philadelphia Company at Pittsburgh for several years, the unification of the Chicago railways in 1905, the rebuilding of the San Francisco railway system after the earthquake, and the reorganization of the Philadelphia Rapid Transit Company in 1911. Necessarily the history of his firm is largely the history of Mr. Ford.

Following the graduation of Mr. Ford from the University of Pennsylvania with the degree of B.S. in 1890, and the advance degree of M.E. in 1891, he served with several electric manufacturing concerns, among them the Short Electric Railway Company, Cleveland. In 1894 Mr. Ford and George W. Bacon formed the consulting engineering firm now known as Ford, Bacon & Davis, Inc. Mr. Davis was admitted to the partnership in 1895. Among the earliest undertakings of the company was the electrification of the railways of New Orleans, including the Orleans Railroad and the Canal & Claiborne Railroad, and the re-equipment of the New Orleans & Carrollton Railroad, Light & Power Company. Following the completion of this work the firm assisted in the unification of the individual systems. Subsequent modernization and reorganization of several other southern properties led to the formation of the American Cities Company, which controlled and managed the systems until 1917.

Another early achievement of the company under Mr. Ford was the rebuilding in 1900, following the purchase in 1898, of the rail line, extending from Edgewater, N. J., opposite New York City, to Leonia. In rebuilding this system and extending it to Hackensack many difficult engineering problems had to be solved.

Two more major activities followed shortly—the electrification and rebuilding of the cable railways of Kansas City in 1901 and the rehabilitation in the same year of the Short Line from Ardmore, Pa., to Llanerch, now known as the Philadelphia & West Chester Traction Company.

In the following year the firm was engaged to develop a unified system of all the street railways in Chicago by the city. It made a detailed study and submitted a comprehensive report which was accepted. The firm was then retained to assist in carrying through the program and putting the system into effect.

A few months before the earthquake which occurred in San Francisco in April, 1906, Ford, Bacon & Davis purchased with others the United Railways, San Francisco, the predecessor of the present Market Street Railway. Following the fire Mr. Ford participated actively in the work of rebuilding the property. The railway was managed by the company until 1926, when it was sold to Byllesby.

In 1910 the firm investigated the property and operations of the Philadelphia Rapid Transit Company for the State Utilities Commission. The recommendations prescribed standards by which the adequacy and efficiency of a railway's operations may be determined. The company was also employed by the city of Philadelphia in 1912 to investigate and report upon a proposed system of subways and elevated railroads. As a result, a report was prepared in collaboration with Transit Commissioner A. Merritt Taylor, which, it is said, was the most comprehensive study of high-speed transportation ever made. The firm was subsequently engaged for three years as consulting engineers on the construction design of the system. For the past two years the company has been making a valuation of Philadelphia Rapid Transit Company holdings.

One of the largest acquisitions of the firm, made in 1912, was that of the Philadelphia Company, owning the rail, light and gas systems in Pittsburgh. These properties were completely rehabilitated shortly after the purchase. The system was sold to Byllesby & Company later. The Lackawanna & Wyoming Valley Railroad, built in 1904 by the Westinghouse Company and other interests for testing equipment, was purchased by Ford, Bacon & Davis in 1913.

Active participation in the modernization or rebuilding of large electric railway city properties has been engaged in by the firm in Washington, Baltimore, New York, Brooklyn, St. Louis, Cleveland, Toledo, Providence, Richmond, Nashville, Duluth, Sioux City, Birmingham, Montgomery, Atlanta, Houston, Little Rock, Kansas City, Mobile, Knoxville and Memphis. Work also has been done in many smaller cities and for several interurban electric railways.

During the war the company prepared studies and maps in collaboration with the American Electric Railway Association, of the electric railway facilities along and adjacent to the Atlantic Coast, for the use of the War Department.

Mr. Ford had been an active member of the American Electric Railway Association since the formation of his company and he contributed much of his time to its advancement. In 1896 and 1897 he represented the association at the National Conference of Standard Electrical Rules, which formulated the original National Electrical Code. He was a member of the association's committee on federal relations for many years, and also served as chairman of the committee on rates and fares, a body which submitted a noteworthy report in 1911.

In July, 1917, Mr. Ford was appointed by Governor Edge of New Jersey as a member of the New York and New Jersey Port and Harbor Development Commission, a body which made a comprehensive study and plan of the port of New York. He was appointed a member of the Port of New York Authority in 1921.

Mr. Ford also was a frequent contributor to technical magazines and wrote many noteworthy articles.

Leonard A. Busby

Leonard A. Busby, president of the Chicago City Railway and one of the country's outstanding figures in electric transportation, died on Sept. 9. He had undergone an operation the previous day for a gland ailment from which he had suffered for three years. He was 61 years old. The malady from which he suffered is believed to have been aggravated by his unceasing efforts in connection with the work incident to the unification plan and the drafting and passage of the co-ordination ordinance recently approved at the polls.



Leonard A. Busby

"If ever a man was a martyr, Mr. Busby was," said Melvin A. Traylor, president of the First National Bank, of Chicago. "He should have looked after his physical well-being a year ago, but didn't take time off to do it because of the muddled state of the traction question."

Mr. Busby's death followed by two weeks the death of Frank O. Wetmore, co-chairman of the First National Bank. Mr. Wetmore was a member of a committee of bankers who are lending their aid in

the solution of the traction problem in Chicago, and in this work he was closely associated with Mr. Busby. Moreover, the two men were close personal friends.

Mr. Busby was born in Jewett, Harrison County, Ohio. He was graduated in 1894 from Ohio Wesleyan University. He later received his law degree from Northwestern University and, subsequently, for many years was engaged in the practice of law in Chicago.

In 1908 he became counsel for the Calumet & South Chicago Railway. That marked his entrance into the railway field in Chicago. Two years later he became counsel for the Chicago City Railway. In 1911 he was elected president of the Chicago City Railway, the Calumet & South Chicago Railway, and the Southern Street Railway. Following his election to these positions he gave up his law practice.

Soon after taking over his new executive duties, Mr. Busby led negotiations which resulted in affiliation of the Chicago City Railway and the Chicago Railways as the Chicago Surface Lines. He was president of this company from 1914 to 1920. He retained, in addition, his position of president of the three south side surface lines.

Mr. Busby was a member of the finance committee of the National Enameling & Stamping Company; a member of the governing committee of the Chicago City & Connecting Collateral Trust; and a director of the Chicago & Alton Railroad, National Bank of the Republic, of Chicago, and Wilson & Company, packers.

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F. R. Fisher

Frank R. Fisher, chief engineer of the Department of City Transit at Philadelphia, Pa., widely known as an expert on subway construction, died suddenly on Aug. 15 at the home of his brother, Frederick S. Fisher, in Lansdowne. Death was attributed to heart disease. He was 58 years old.

Soon after his graduation from Lehigh University in 1891 Mr. Fisher was appointed to the city's service in the bureau of surveys. During the Market Street subway-elevated construction he was resident engineer for the Philadelphia Rapid Transit Company. He was named chief engineer of the Transit Department in 1924.

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J. L. Esson

John Leonard Esson, well-known engineer and vice-president of Ford, Bacon & Davis, Inc., New York, died suddenly on Sept. 21 at the age of 52.

Mr. Esson was a native of Glasgow, Scotland. His parents settled in Chicago when Mr. Esson was a boy. There he was educated in the Chicago Manual Training School, since absorbed by the University of Chicago. His first work was in the accounting field, but 23 years ago he turned to engineering.

In his new field he became expert as a business consultant and economist, his advice being sought in many important projects in this and other countries.

✦

John H. Sheridan

John H. Sheridan, former superintendent of employment of the Los Angeles Railway, Los Angeles, Cal., is dead. Mr. Sheridan entered the employ of the Los Angeles Railway on Jan. 1, 1915, as special representative. In August, 1917, he was appointed an investigator in the claim department, which position he held up to the time of his transfer as investigator in the employment office. In this capacity he served until September, 1928, when he was appointed superintendent of employment.

As a boy, Mr. Sheridan took up telegraphy, later moving to Boston to work for the Boston & Maine Railroad. Like many other men, he heard the call of the West, and he entered the employ of the Southern Pacific Railroad. With this organization he worked his way up to chief dispatcher of the San Joaquin Division. He returned East for a short time only to return to the West as train dispatcher for the Santa Fé Railroad.

✦

Frederick Guilfoyl, superintendent of the American Brake Company's St. Louis, Mo., plant, died on Sept. 17 after an illness of eight weeks. Mr. Guilfoyl went to St. Louis from Pittsburgh, Pa., 25 years ago to become superintendent for the brake company. Prior to that he had been associated with the Westinghouse companies in the Pittsburgh district for about ten years.

Thomas F. Griffith, for the past ten years superintendent of the Lexington division of the Middlesex & Boston Street Railway, Boston, Mass., died on Sept. 9. He was born in County Galway, Ireland, on Dec. 13, 1872, but had lived in this country since a young man. He was one of the oldest employees in point of years of service of the Middlesex & Boston Street Railway, formerly the old Lexington & Boston Street Railway.

✦

Hermon Bongard, long a district and then a division superintendent of surface lines in Brooklyn, which he served for 40 years, died on Sept. 6, after a long illness. He was 60 years old.

✦

William P. Stanton, an investigator for the St. Louis Public Service Company, St. Louis, Mo., died on Sept. 14 following several weeks' illness. In his work for the company's claim department he usually answered the call docket for damage suits filed against the company in St. Louis Circuit Court.

Industry Market and Trade News

Gain Over 1929 Reported by J. G. Brill

Distinct improvements over 1929 have been indicated in the business of J. G. Brill Company for this year. Sales thus far in 1930 have run consistently ahead of the same period for last year. The full year will undoubtedly show a satisfactory increase over 1929, when the company reported total sales of $6,457,630.

No new large orders have been received recently, still bookings at the present time are 10 per cent to 15 per cent higher than at this time last year. To the Gulf, Mobile & Northern Railway was shipped, in the early part of September, an unusually long and powerful motor car train, propelled by a single gas-electric power plant. Shipment was made up of a model 860 motor car and four trailers, together with an additional motor car.

Although further pick-up in business is expected to be slow, the outlook is considered favorable.

Sales of Ohio Brass Hold Up Well

Showing a continued strength in sales, the Ohio Brass Company has been able to maintain the annual extra dividend of $1 on the common stock, started last year. This reflects the small percentage of decrease in earnings the company has experienced for the year.

July and August showed some decline in the industry. Satisfactory increase for the month of September is reported by the Ohio Brass, and prospects for October and November appear even better. The expansion programs which the public utility companies are putting into action are expected to reflect favorably in the sales of Ohio Brass manufactured products.

Although the earnings so far this year have fallen from the level of 1929, when the company earned $7.78 per common share, compared with $5.24 in the previous year, it seems probable that net profit for the full 1930 year will be above the 1928 figure. The volume of export business for the year has had a substantial increase. Further increase is probable as a result of a prospective contract with the Egyptian Government and negotiations carried out with India and the Soviet Government regarding other contracts.

More Buses Are Delivered by Manufacturers

Deliveries of buses to electric railways continue to maintain a steady and normal pace at this time of the year. No unusually large order has appeared; many have been for one or two units. An interesting delivery was that of seven trolley buses by the Twin Coach Corporation to the Chicago Surface Lines to add to its present fleet of 55. Twin Coach also made deliveries of two large-capacity urban buses to the United Electric Railways, Providence; three of this type to Aronimink Transportation Company, Upper Darby, Pa.; and of the small-capacity type, the Eastern Texas Electric Company received three, and the Cincinnati Street Railway, two.

From the General Motors Truck Corporation, the Connecticut Company, New Haven, received eight Type Z, 38-passenger city service coaches; Potomac Edison Company, Cumberland, Md., seven Type U, 21-passenger city service coaches; Illinois Power & Light Company, Champaign, three Type Z, 29-passenger city service coaches; Mississippi Valley Electric Company, Iowa City, three Type U, 21-passenger city service coaches; Eastern Texas Electric Company, Beaumont, two Type U, 25-passenger city service coaches; and the North Carolina Public Service, Greensborough, one Type W, 23-passenger city service coach.

Boston Elevated Railway accepted deliv-

ery of ten A. C. F. 40-passenger, all-steel metropolitan coaches. Triple Cities Traction Company, Binghamton, received from the same manufacturers two 33-passenger street car coaches.

White Company made deliveries of twelve buses divided as follows: five Model 65A, to Louisiana Power & Light Company, Algiers, La.; one Model 65 and one Model 65A to Denver Tramway Corporation, Denver; two Model 54, to West Penn Electric Company, Pittsburgh; two Model 61, to Susquehanna Transit Company; one Model 54A, to the Boston, Worcester & New York Railway; one Model 65A, to the Burlington Rapid Transit Company, Burlington, Vt.; and one Model 65, to the West Short Transit Company, Annapolis, Md.

Deliveries by the Mack-International Motor Truck Corporation consisted of four Model BC equipped with 29-passenger city type bodies to the Louisville Railway, two Model BC to the Denver Tramway, and one Model BG to the Fishkill Electric Railway, Beacon, New York.

Copper Lowest in 30 Years at 10¾ Cents per Pound

Domestic price of copper was reduced during the past month by leading producers from 11 to 10¾ cents per pound, while at least one custom smelter, that had been quoting 10¾ cents, reduced its price to 10½ cents. These new prices are the lowest in 30 years, and compare with 18 cents in effect from April, 1929 to April, 1930, when the decline began. Despite the slash, little metal was disposed of. It was reported that consumers who had placed large orders in June and July have deferred delivery.

General expectancy among speculators of a further drop has been a factor in holding back orders from consumers. Statistics of the August report disclose an increase of more than 25,000 tons in stocks of refined copper for that month. This is regarded in some quarters as presaging a further lowering in price in the effort to get sales; and it is also pointed out that large producers have known that stocks have been increasing and that, if a further cut was in mind, it would have come before this time.

American Brass Company, controlled by the Anaconda Copper Mining Company, has announced recently a ¼-cent reduction in all brass and copper products, including scrap and seamless tubes. The cut in prices was first announced by the Anaconda Wire & Cable Company, and was later met by the Chase Metal Company and Revere Copper & Brass Company.

G. E. Questions for Welding Inspectors

As an aid in the instruction of inspectors in the elementary and fundamental features of arc-welding as applied to ordinary steel building construction, a group of 35 questions with answers have been prepared by Frank P. McKibben, consulting engineer of the General Electric Company.

The co-operation of welding engineers, contractors and building commissioners was enlisted in this undertaking. A great many of the questions are of an elementary nature to enable men who have not had much experience with welding to ground themselves in the fundamental principles.

Orders Placed for Supervisory Control Equipment

Steadily increasing trend to supervisory control for centralized remote control of electrical power apparatus is reflected by two large orders recently received by the Westinghouse Electric & Manufacturing Company for Visicode type supervisory control equipment. These orders cover a total of 25 Visicode equipments, five having been purchased by the Long Island Railroad and twenty by the Reading Company. In addition, these orders include the switchboards for the main stations involved.

The Reading Company order covers equipment for the initial railway electrification of their Philadelphia suburban area. Seven power substations and fourteen intermediate stations in this area, which will supply current to the electrified zone of the railroad, will be entirely unattended and will be operated from a central point located in the load dispatcher's office at Wayne Junction by means of the Visicode type of supervisory control. When completed, this will be one of the largest and most extensive supervisory control systems ever installed.

Supervisory control for five substations is covered by the order of the Long Island Railroad. Four of these stations will contain mercury arc rectifiers which will be controlled by means of automatic switching equipment included on this same order. This equipment will, in turn, be remotely operated by the Visicode supervisory control. The other station will contain track breakers which will also be remotely controlled by Visicode supervisory control.

Ten New Locomotives Ordered by the New Haven

Ten 3,500-hp. electric locomotives for service on the New York, New Haven & Hartford Railroad are under construction at the Erie, Pa., works of the General Electric Company. The units, which will operate with either alternating or direct current, will handle main-line passenger trains between New Haven and New York City, including operation over the 600-volt, third-rail section of the New York Central Railroad into Grand Central Terminal or over the Hell Gate route to Pennsylvania Station.

The locomotives will weigh, complete, approximately 200 tons, with 135 tons on the driving axles. Each unit will have a capacity of fifteen 80-ton cars on level tangent track at 65 m.p.h. on alternating current, and at 58 m.p.h. on direct current, with maximum speed of 70 m.p.h.

Designated as the 2-CC-2 type, they are equipped with six spring quill mounted, twin-armature, single-phase, commutator type motors designed for operation at 210 volts per armature. Each motor will have a one hour rating of about 575 hp. The two three-axle trucks are connected by an articulated joint with extensions at the outer ends supported on two-axle guiding trucks. The cab is of the box type with an apparatus compartment in the center and an operating compartment at each end. An air blast transformer is used, having reduced capacity taps on the low voltage winding for the protection of compressors and blowers. Both two-stage air compressors have a piston displacement of 100 cu.ft. per minute when operating at a pressure of 135 lb. per sq.in.

The principal dimensions (approximate) are:

Length inside knuckles	77 ft. 0 in.
Length of cab	60 ft. 0 in.
Total wheelbase	66 ft. 0 in.
Rigid wheelbase	14 ft. 0 in.

The cost of the locomotives will be $2,000,000. It is expected that they will be delivered to the railroad before the end of August, 1931.

Quigley Company offers for distribution a booklet describing the uses of Annite, a colloidal cleaning compound. This booklet may be obtained by addressing the company at 56 West 45th St., New York, N. Y.

First Section of Reading Overhead Completed



Work on the electrification of the Reading Railroad in Philadelphia and vicinity is proceeding according to schedule. This illustration shows the first completed section of the catenary and overhead construction, which extends northward from the Market Street terminal

Chrysler Announces Fargo Coaches

Chrysler Motors Corporation, of Detroit, announces the organization of a new division, to be known as Fargo Motor Corporation, which will engage in the manufacture of a line of motor coaches consisting of two series.

The Model 80 series will comprise a conventional 21-passenger coach of the street car type and a 16-passenger parlor coach. The Model 90 series will include a 21-passenger circulating load street car type coach, having a standing capacity of approximately 30 additional passengers; also a 21-25-passenger parlor type coach. The 90 series are said to include a number of original features. The product will be sold by the Fargo Motor Corporation direct to operators.

Lamme Award to Morris Stone

Second award of the Benjamin Garver Lamme Scholarship has been granted to Morris Stone, mechanical engineer of the Westinghouse Electric and Manufacturing Company. The scholarship provides one year's advanced study at any college or university in America or abroad.

This scholarship has been established in perpetuity by the Westinghouse Electric & Manufacturing Company in honor of the late B. G. Lamme, who was chief engineer of the company. Any engineer who has been in the employ of the company one year or more, and evidences unusual promise for future development, is eligible for the award.

Morris Stone was graduated from the Engineering School of Harvard in 1923, establishing scholastic records. Besides receiving the highest academic rating, Mr. Stone was also elected to the honorary engineering fraternity.

In 1925 he received his master's degree from Harvard, and in the same year joined Westinghouse. After working for three years in the research laboratory on general electricity and vibration problems, he was transferred to the power engineering department.

Mr. Stone is the author of several original treatises, specializing in problems dealing with the mechanical aspects of electrical engineering. One article in particular, "The General Torsion Problem," has secured considerable recognition in the engineering world. This paper was presented to the Third International Congress of Engineers held in Sweden in the summer of 1930. Mr. Stone has selected the Universities of Berlin and Charlottenburg at which to continue his studies.

TRADE NOTES

Robert W. Hunt Company, Engineers, announces the retirement of its president, John J. Cone, who has been a member of the company since its organization in 1888. C. B. Nolte, vice-president and general manager, has been elected president and general manager, with headquarters at the general office, Chicago. J. C. Ogden, a director and eastern manager of the company, has been elected vice-president, with headquarters at New York City.

✦

Leeds, Tozzer & Co., Inc., 75 West Street, New York, N. Y., have prepared a 16-mm. moving picture of their automatic car washing machine, with titles in English and Spanish. The film is available, upon request, for display before associations, conventions and sectional meetings.

✦

Ohio Brass Company announces the removal of its Dallas office from the former location in the Insurance Building to 1010 Allen Building, corner of Commerce and Ervay Streets.

✦

Union Metal Manufacturing Company, Canton, Ohio, announces the removal of its Eastern office from Philadelphia to 110 East 42nd Street, New York City. E. B. Comfort, eastern district sales manager, will be located in the same suite with W. A. Daunt, New York sales manager for the company.

✦

Leavitt Machine Company, Orange, Mass., has appointed Charles C. Phelps, manufacturers' agent, 11 Park Place, New York, as its sales agent for metropolitan New York and northern New Jersey to handle the Dexter valve reseating machine for globe, gate and pump valves.

✦

Lincoln Electric Company, Cleveland, Ohio, manufacturer of "Stable-Arc" welders, and "Linc-Weld" motors, announces the opening of new offices in Saginaw, Mich., Fort Wayne, Ind., and Oil City, Pa. The Saginaw office is located at 338 Barnard Street, and is in charge of J. E. Luter. The Ft. Wayne office is in charge of D. H. Carver, and is located at 225 E. Columbia Street; E. D. Anderson is in charge of the new office in Oil City, Pa.

Advertising Literature

Westinghouse Electric & Manufacturing Company offers a 60-page special publication on oil electric locomotives and rail cars. A general analysis of the characteristics and field of application of the oil electric locomotive in comparison with other motive power plants is interestingly presented. Devoted to the selection of equipment is a section giving some short-cut methods to determine the approximate application with the aid of characteristic curves.

✦

General Electric Company has published a treatment on mercury-arc rectifiers for railway use, which is designated as publication GEA-1151A. Characteristics of the mercury arc, rectifier auxiliaries and the cooling system, operating features and construction of rectifiers are covered in this publication.

✦

Sangamo Electric Company, Springfield, Ill., has published in pamphlet form a series of articles devoted to increasing the effectiveness of a load-building program. The articles are illustrated with graphs and charts describing the performance of the Sangamo meters.

✦

Fabrikoid Division of the du Pont Company has issued a booklet dealing with the style, design, color and texture of lacquered fabrics which may be used as substitutes for leather. Many illustrations are given to show how this fabric enters into the decoration scheme of many fields.

✦

General Electric Company has issued a booklet describing briefly copper brazing processes and the copper brazing furnaces which it manufactures. A recently developed process of hydrogen-copper brazing is discussed at some length with a view of presenting some of its advantageous applications.

Electric Railway Material Prices—October 1, 1930

Metals—New York

Copper, electrolytic, delivered, cents per lb.	10.275
Lead, cents per lb.	5.50
Nickel, cents per lb., ingot	35.00
Zinc, cents per lb.	4.25
Tin, Straits, cents per lb.	29.85
Aluminum, 98 to 99 per cent, cents per lb.	23.30
Babbitt metal, warehouse, cents per lb.:	
Commercial grade	37.00
General service	31.00

Bituminous Coal

Smokeless mine run, f.o.b. vessel, Hampton Roads, gross tons	$4.15
Somerset mine run, f.o.b. mines, net ton	1.75
Pittsburgh mine run, Pittsburgh, net ton	1.40
Franklin, Ill., screenings, f.o.b. mines	1.50
Central, Ill., screenings, f.o.b. mines	1.05
Kansas screenings, Kansas City	1.50

Track Materials—Pittsburgh

Standard steel rails, gross ton	$43.00
Railroad spikes, drive ½ in. and larger, cents per lb.	2.80
Tie plates (flat type), cents per lb.	2.075
Angles bars, cents per lb.	2.75
Rail bolts and nuts, cents per lb.	3.90
Steel bars, cents per lb.	1.63
Ties, white oak, Chicago, 6 in. x 8 in. x 8 ft.	$1.35

Hardware—Pittsburgh

Wire nails, base per keg	$2.10
Sheet iron (24 gage), cents per lb.	2.40
Sheet iron, galvanized (24 gage), cents per lb.	3.05
Galvanized barbed wire, cents per lb.	2.75
Galvanized wire, ordinary, cents per lb.	2.70

Waste—New York

Waste, wool, cents per lb.	12.00 to 15.00
Waste, cotton (100 lb. bale), cents per lb.:	
White	9.00 to 13.00
Colored	5.00 to 7.00

Paints, Putty and Glass—New York

Linseed oil (5 bbl. lots), cents per lb.	10.8
White lead in oil (100 lb. keg), cents per lb.	13.75
Turpentine (bbl. lots), per gal.	0.485
Putty, 100 lb. tins, cents per lb.	5.50

Wire—New York

Copper wire, cents per lb.	10.75
Rubber-covered wire, No. 14, per 1,000 ft.	$4.62
Weatherproof wire base, cents per lb.	13.375

Paving Materials

Paving stone, granite, 5 in., f.o.b.:	
New York—Grade 1, per thousand	$150.00
Wood block paving 3½, 16 lb. treatment, N. Y., per sq.yd., f.o.b.	2.50
Paving brick 3½x8½x4, N. Y., per 1,000 in carload lots, f.o.b.	50.00
Paving brick 3x8½x4, N. Y., per 1,000 in carload lots, f.o.b.	45.00
Crushed stone, ¾-in., carload lots, N. Y., per cu.yd., delivered	3.40
Cement, Chicago, in carload lots, without bags, f.o.b.	1.95
Gravel, ¾-in., cu.yd., delivered New York	3.40
Sand, cu.yd., delivered New York	2.15

Old Metals—New York and Chicago

Heavy copper, cents per lb.	8.50
Light copper, cents per lb.	7.75
Heavy yellow brass, cents per lb.	5.50
Zinc, old scrap, cents per lb.	2.25
Lead, cents per lb. (heavy)	4.25
Steel car axles, Chicago, net ton	$15.25
Cast iron car wheels, Chicago, gross ton	13 75
Rails (short), Chicago, gross ton	14.25
Rails (relaying), Chicago, gross ton (65 lb. and heavier)	28.50
Machine turnings, Chicago, gross ton	6.25

The ounce of prevention

Virtually that is what a 72 lb. Peacock Staffless Brake is. It exerts 3000 lbs. braking power regardless of condition of brake shoes.

To meet schedules in this high speed traffic age, Safety must be assured.

NATIONAL BRAKE CO., Inc.

890 Ellicott Avenue, Buffalo, N. Y.

Canadian Representative: Lyman Tube & Supply Co., Ltd., Montreal, Can.
The Ellcon Company—General Sales Representatives, 50 Church St., New York

PEACOCK STAFFLESS BRAKES





Operation of K Rims is simplicity itself!

Pry No. 2—at the side. Rim is ready for tire

Pry No. 1—at the joint



"K" RIMS

as standard fleet equipment save valuable operating time

Goodyear K Rims for trucks and buses are interchangeable, singles or duals. They may be removed from tires in about three minutes. They go together quickly and stay firmly locked. Thus as standard fleet equipment they offer an easy way to cut out unnecessary labor expense. They save operating time. No stronger rim on the market—yet remarkably light. Safe, dependable, easy and fast to operate — equip now with economical K Rims. Specify for new units.

Serviced and distributed by authorized wheel and rim distributors everywhere. Just say, Goodyear K Rims.

THE MAN WHO CHANGES THE TIRES LIKES K RIMS

GOODYEAR

Akron, Ohio

K RIM EQUIPMENT FOR TRUCKS AND BUSES



One of the coaches from the Chevy Chase fleet of The Capital Traction Company, Washington, D. C.



248,298 MILES

between tire delays

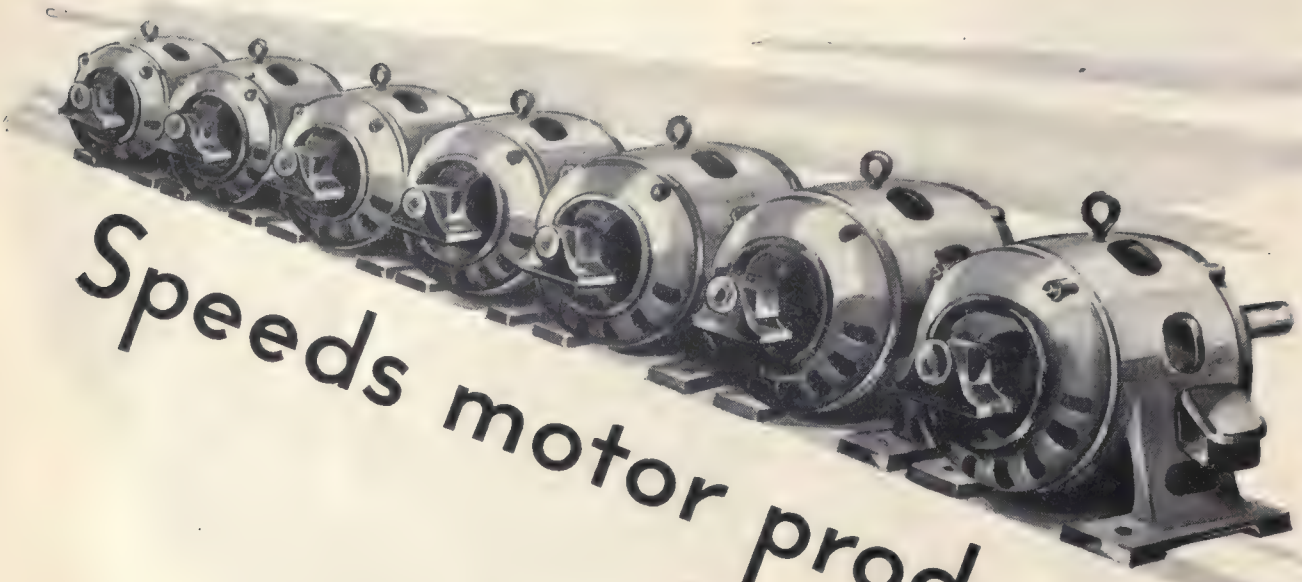
On the Chevy Chase Coach Line, Goodyear Balloon Tires average 248,298 miles per tire delay—on the whole fleet of The Capital Traction Company the average is 93,716 miles. These are the figures for 1929—they tell in a definite way why great coach fleets from coast to coast are equipped with Goodyears. More people ride on Goodyear Tires than on any other kind—in private passenger cars as well as in motor coaches—for a very good reason: superior performance.

THE GREATEST NAME IN RUBBER

GOODYEAR

On your new motor coaches specify Goodyears

Higher Baking Temperature



Speeds motor production

THAT is one of the reasons so many of America's motor builders are insulating the commutators with Super-Micanite. This unusual electrical insulation permits of baking temperatures above that which ordinary built-up Mica will withstand. Quicker production is the result.

That's not all. A better commutator is also produced. Super-Micanite has greater electric strength and less surface leakage. It is denser, hence assures more accurate spacing of commutator bars and greater ease in assembly. Even at high temperatures no corrosive decomposition products are formed.

These outstanding advantages have made Super-Micanite the choice of leading motor and generator builders. Many of its varied uses are described in Catalog 87. Write for a copy.

MICA INSULATOR COMPANY

New York: 200 Varick St. Chicago: 542 So. Dearborn St.
Cleveland Pittsburgh Cincinnati Birmingham Seattle
San Francisco Los Angeles Toronto Montreal
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PERFECT MICANITE INSULATOR REG. U.S. PAT. OFF.

Electrical INSULATION

PERFECT EMPIRE INSULATOR REG. U.S. PAT. OFF.

MICA INSULATION OILED CLOTH INSULATION



A Seat That Will Stand Abuse!

Here is an ideal seat for your bus equipment. It is a high back, all leather chair, with a selecied hardwood frame accurately joined and reinforced at all vital points by malleable iron braces. The 55 P Special will stand the hard usage which every bus chair is bound to receive, yet it is extraordinarily comfortable. It has spring-filled cushions over our deep, built-up spring construction and individual, spring-filled backs. The 55 P Special is mounted on double-clawed, malleable iron legs equipped with heavy rubber shock absorbers. Ask the nearest H-W sales office about this and many more of our modern, practical bus and railway seats.



If you have not received a copy of our new Bus Seat Catalogue, write for it.

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PACIFIC GREYHOUND BUSES SERVE The ENTIRE WEST



CARRYING Pacific Greyhound Buses, Firestone Bus Balloons undergo the toughest travel—sand, mud, ice, snow and desert—pile up millions of miles annually and, by their unequalled performance, permit Pacific Greyhound Lines to maintain "On-Time" schedules on their hardest runs.





Specify
ON YOUR NEW BUSES
Firestone
BUS BALLOONS

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CHRYSLER MOTORS

ANNOUNCES

FARGO

BUILT BY CHRYSLER MOTORS

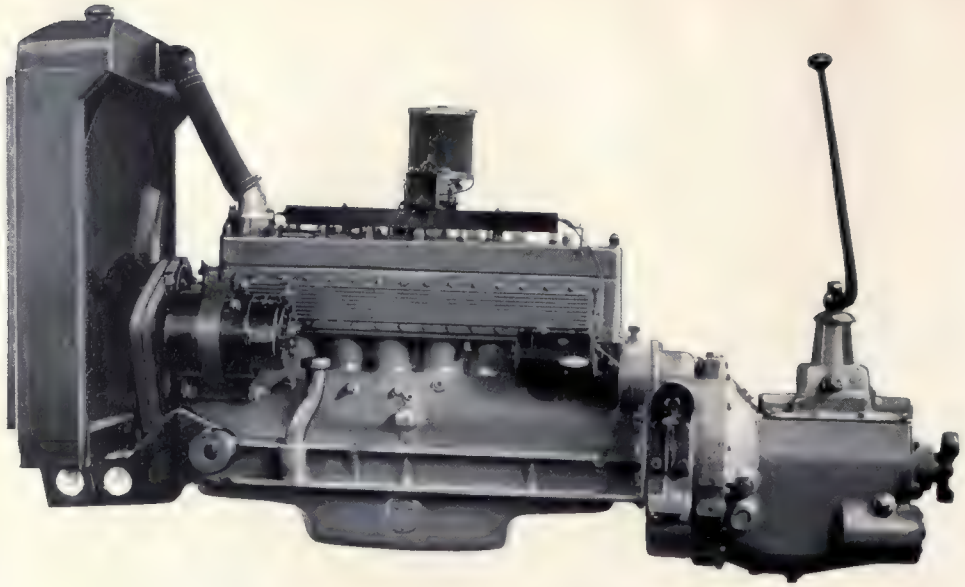


MOTOR COACHES

TO BE SOLD DIRECT TO OPERATORS BY

FARGO MOTOR CORPORATION

A DIVISION OF CHRYSLER CORPORATION



New and different radiator to





POWERFUL, 8-cylinder engine develops 120-horsepower. Rugged, heavy-duty transmission has four forward speeds. Radiator provides exceptionally large cooling area. The entire power plant—including engine, radiator, clutch and transmission—is quickly removable as a unit from front end of chassis.

Engine is easily accessible through door at front of body interior. The convenience of this practical arrangement—which establishes a new and noteworthy practice in motor coach design—will be readily appreciated by experienced operators.

The unusually rugged 10" frame is of the double-drop type. Outriggers are lined up with cross-members to provide a firm base for body.

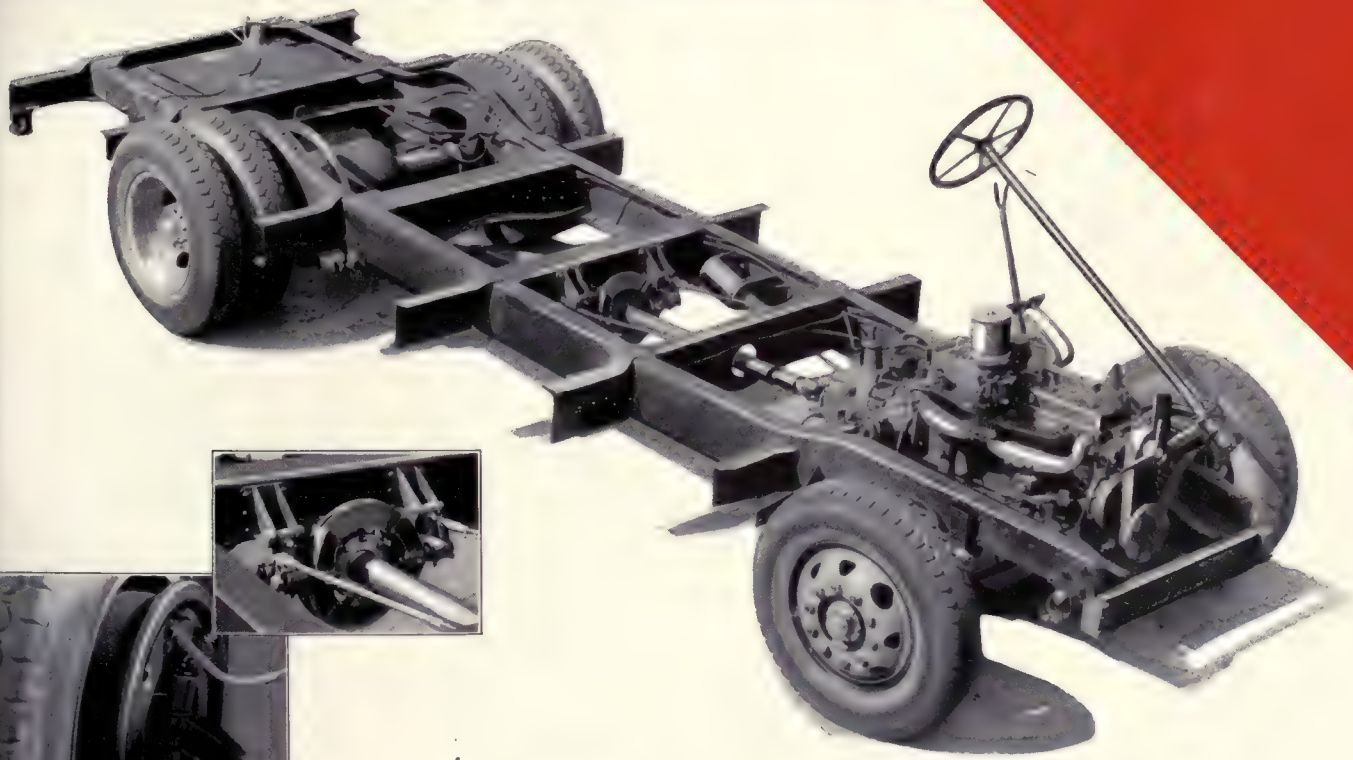


from tail light

REAR axle is of the full-floating, worm-drive type, with electric furnace cast steel housing. Shafts are free to perform the sole task of driving wheels—weight of coach and load is carried on housing. Two double tapered roller bearings are at outer ends of housings.

Steering gear is the full-contact, worm and sector type, with roller bearing on shaft. Unique construction and mounting minimize reaction in wheels, insure an unusually short turning radius and contribute to increased driving ease.

Service brakes are 4-wheel internal hydraulic—self-equalizing and weatherproof. Booster provides the additional braking effort so necessary for present-day coach operation. The ease with which brakes can be applied is worthy of special note. Driveshaft hand brake of the ventilated disc type is self-aligning in all directions.





FARGO
BUILT BY CHRYSLER MOTORS

Body Specifications

MOTOR COACHES

FRAMEWORK: Framework is of second growth thoroughly seasoned oak throughout. Oak body pillars are mortised, glued and screwed to the roof rail and anchored by malleable brackets on each side. Brackets also rigidly join the roof carlines to the pillars. Pillars are anchored with bracket to main body sill. All wooden parts are thoroughly treated with lead and oil; non-rusting screws are used throughout.

FRONT END: Front-end construction is of the vertical buttress type having corner pillars of structural steel angles with structural steel framework supporting the windshield. Entire structure is riveted, welded, and reinforced with gussets for maximum rigidity.

SKIRTING: Skirting is reinforced with heavy steel brackets bolted to main sill and pillars and to the angle iron extending entire length of body which rests on the chassis outriggers.

SKID RAIL: Sides and rear of body are protected with heavy oak skid rail, designed in such a manner that shocks from impact are transmitted direct to the chassis frame and are not absorbed by the body.

SIDE PANELS: ¼" Plymetl installed in sections and screwed in place. The upper panels overlap the Plymetl to prevent moisture from entering framework.

ROOF: Haskelite, covered with cotton padding and thoroughly waterproofed duck.

FLOORING: 1⅛" yellow pine, tongue and groove, laid crosswise and covered with $\frac{3}{16}$" battleship linoleum in one piece.

WINDSHIELD: 2 Panel "V" type, sloping windshield, permanently installed in Bonderized steel sash which rests in structural steel framework. Two double blade wipers with motors and mechanism completely concealed. Adjustable side quarter, ventilating windows of swinging type.

WINDOWS: Street Car—Raised type with satin nickel finished brass sash and equipped with anti-rattlers; fixed upper transoms. Glazed with double strength glass. Window lift is 16". Window at left of driver in two sections with sliding sash for signalling purposes. Rear windows are stationary and fitted with wire reinforced glass. Parlor Car—Raised type with satin nickel finished brass sash and equipped with anti-rattlers. Glazed with double strength glass. Window lift is 11½". Side windows are fitted with shades, with rollers operating in wooden grooves. Rear quarters are fitted with curved glass and rear windows are stationary.

ENTRANCE DOOR: Street Car—Double, two leaf folding type at right front, vacuum operated; controlled from driver's seat. Parlor Car—One-piece type operated by adjustable mechanism from driver's seat.

STEPS: All metal with non-skid safety tread.

EMERGENCY DOOR: Parlor Car—On left side at rear, secured by positive lock with signal device.

EXIT DOOR: Street Car—Double, two leaf folding type at rear, vacuum operated; controlled from driver's seat.

SEATS: Street Car—Left side—Three 2-passenger seats 34" wide with individual backs; one 3-passenger longitudinal seat over wheelpocket. Right side—One 2-passenger longitudinal seat at right front; two 2-passenger seats with individual backs; one 2-passenger longitudinal seat over wheel pocket. Rear—Four-passenger seat across rear. Seat cushions and backs are of deep spring construction. Upholstery, including binding and welt, is genuine leather. The rear of the seat backs only are upholstered in imitation leather to match. Grab handles on aisle side of cross seats. Cross seats are staggered providing greater aisle space. Driver's seat is adjustable. Parlor Car—Four double seats of the 3-position reclining type operated by finger control, are located on each side. A section of 5 individual seats extends across the rear. Seats are constructed of steel tube framework covered with wicker woven from fiber and entire seat is upholstered in rubber backed flat mohair which can be easily cleaned with soap and water. Driver's seat is adjustable and upholstered in genuine leather. Folding aisle seats also available.

SIGNAL SYSTEM: Bell Cord.

HEATING SYSTEM: Kysor exhaust type. Heated air enters body through three ducts effectively located.

VENTILATORS: Street Car—Three coach type ventilators in roof and two in cowl. Parlor Car—Four coach-type ventilators in roof and two in cowl. In both Street Car and Parlor Car one cowl ventilator ventilates the body while the other ventilates engine room.

LIGHTING: Street Car—Interior: ten 15-candle power dome lights on two circuits. Step light at entrance and exit doors. Exterior—Two marker lights, front and rear, with 4" lenses. Parlor Car—Interior lighting is designed in modernistic style having aluminum fixtures at each post above windows with mirrors located between lights. There are five 15-candle power lights on each side on separated circuits. Exterior—Two marker lights, front and rear with 4" lenses. On both Street Car and Parlor Car two stop lights at rear and two adjustable headlamps with depressed beam operated by foot switch.

ADVERTISING RACK: Street Car—On each side and across rear above windows. Accommodate standard cards.

OUTSIDE TRUNK RACK: Parlor Car—Trunk rack with tarpaulins on rear of roof with ladder at rear. Roof retains streamline effect from front to rear.

INSIDE LUGGAGE LOFTS: Parlor Car—Plymetl luggage lofts with solid bottoms and lined with carpet are located on each side and illuminated.

DESTINATION SIGN: Hunter roller type accommodating 4½" letters. Space on curtain for 15 names.

GRAB RAILS: Street Car—One horizontal rail at right of entrance door; one vertical rail at left of entrance door and one at left of rear exit door. Grab rails on ceiling at each side of aisle. Parlor Car—Horizontal rail at right of entrance door. Aluminum alloy hand rails located on edge of luggage lofts.

GENERAL DIMENSIONS:

Overall length of body	247"
Overall width of body	96"
Inside width	90½"
Inside height Minimum	76"
Inside height Maximum	78"

LENGTH:

Overall (Bumper to Bumper)	
Street Car	284"
Parlor Car	302"

FARGO MOTOR CORPORATION

DETROIT, MICHIGAN



10

THOMAS BUILT CARS

For Knoxville Power & Light Company

Knoxville, Tenn.

TO ASSURE their passengers the utmost in comfort, efficiency and safety, the progressive management of the Knoxville Power & Light Company recently placed 10 "Thomas-built cars" in service. Almost over night the new cars won the praises of both passengers and operator alike.

These attractive new lightweight all-steel cars of the one-man, double-end, double-truck and arch-roof type are designed for economical and satisfactory service with sufficient strength to meet all requirements and yet not be of excessive weight.

Thomas BUILT CARS

Perley A. Thomas Car Works, Inc.

High Point, N. C.

In full view ... again reveal more

NOTE—RAIL DEFLECTION SPACE BETWEEN RAIL AND CONCRETE



DAYTON TIES
indisputable evidence

"WHAT HAPPENS to the concrete under the rail between your ties supports?" For years we have asked engineers to believe that the concrete between the ties became pulverized as a result of the deflecting action of rails under traffic—and that when this action was completed—Dayton Ties exercised their full function of dampening the vibratory shock of traffic and thus giving full protection to the substructure. These unretouched photographs taken of a Dayton Tie installation, which is being removed for grade lowering necessitated by overhead steam road crossing, show beyond a doubt this deflection space between the rail base and the concrete. It is this minute deflection space which permits the patented Dayton Tie Block to exercise its full shock absorbing and supporting function—and assures absolute protection to the concrete substructure. As shown by these photos this deflecting action takes place only where the steel of the rail between the ties contacts the concrete. The concrete around and under the wood tie block remaining in perfect bond.

It is such overwhelming evidence as this that proves that Dayton Ties—are absolutely alone in their supremacy as the long life—maintenance free—low installation cost—tie. Why not investigate Dayton Ties by writing today for full information or permit us to tell you where you may see a Dayton Tie installation and judge their merit with your own eyes.

Here's a point to remember!

Dayton Ties are rigid in the structure but flexible within themselves. If they were not—the deflecting action of the rail coupled with the vibratory shock of traffic would expose the entire structure both under the rail and under the tie to deterioration. The patented asphalt fibre base of Dayton Tie Blocks serves a double purpose for not only does it take up rail deflection and shock—without deformation of its properties, but by so doing, permits the tie and the substructure under the tie to become a fixed point of rigidity which is essential to the life of the track.

The Dayton Mechanical Tie Company

Dayton, Ohio

Reduce track construction cost with these Steel Ties

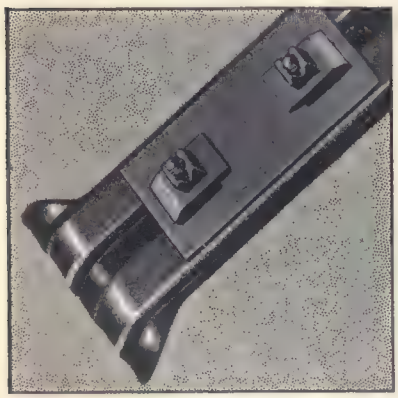
Bethlehem Steel Ties offer many new advantages and economies in street railway track construction. Substantial savings in installation costs are to be had, because of the low first-cost of these steel ties, the simplicity of track laying, the saving in height and the reduction in foundation material and in labor.

Due to the shallow section of these ties, excavation is greatly reduced and there is a corresponding reduction in the amount of ballast or concrete. Actual cost records of track construction jobs show that the use of Bethlehem Steel Ties results in a saving of from 25 to 30 per cent as compared with the use of wood ties. Consideration must also be given to the savings in handling and in distribution costs, due to the shallow, compact section of these steel ties, which reduces bulk in handling.

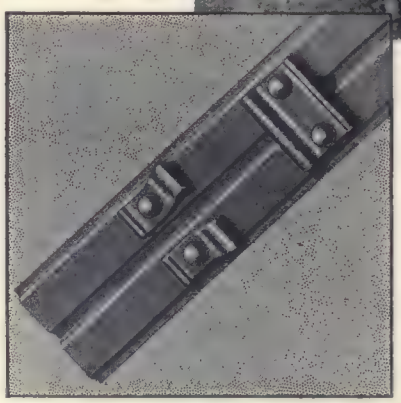
Bethlehem Steel Ties for street railways are made in two sizes to meet different ballasting conditions and track construction practices. Complete information about Bethlehem No. 3 Steel Tie and Keystone No. 9 Steel Tie will gladly be supplied. Write for literature.



Reconstructed single-track structure with Bethlehem No. 3 Steel Ties.



The Keystone Steel Tie No. 9 is a heavy-duty tie with tie plates, bolted rail clips and "whale-tail" ends.



The Bethlehem No. 3 Steel Tie is equipped with a broad stationary clip and two rotating clips.

BETHLEHEM STEEL COMPANY

General Offices: **Bethlehem, Pa.**

District Offices: New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Pittsburgh, Buffalo, Cleveland, Cincinnati, Detroit, Chicago, St. Louis

Pacific Coast Distributor: Pacific Coast Steel Corporation, San Francisco, Los Angeles, Portland, Seattle, Honolulu

Export Distributor: Bethlehem Steel Export Corporation 25 Broadway, New York City

BETHLEHEM Steel Ties



Linking the continents with speech

Today, through the Bell System's radio-telephone service, you can talk directly from your home or office telephone to most of the countries of Europe, to Argentina, Chile and the city of Montevideo, Uruguay, or to several great transatlantic liners while at sea.

Before long, your telephone horizon will be extended to Hawaii and other islands in the Pacific, to the mainland of Asia and to additional countries in Europe and South America. Bell System engineers are steadily enlarging the scope of voice-to-voice contact, bringing new continents, new nations, new cities and hamlets within reach of your telephone.

Talking to Europe, to South America, to ships at sea, is almost as satisfactory as an across-the-desk conference. You can transact business and exchange personal messages with the ease and clearness of an ordinary long distance call. Questions can be settled as they arise.

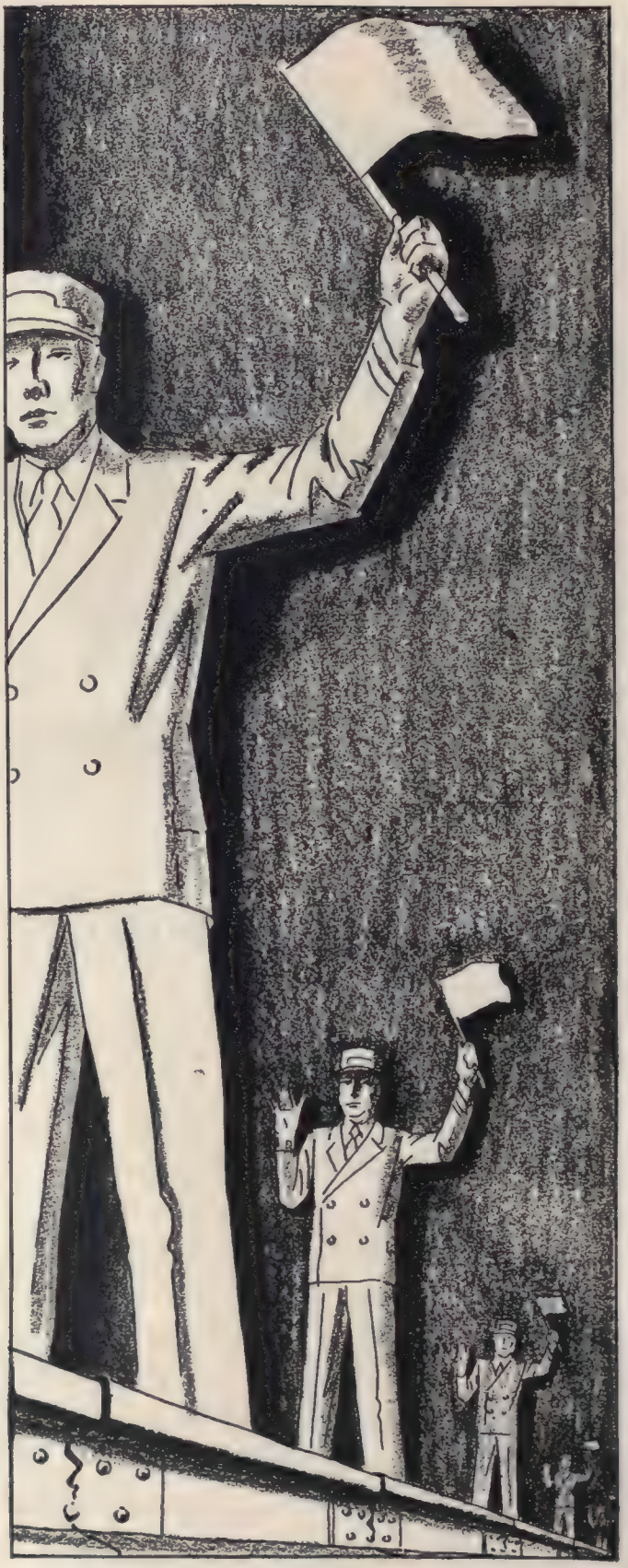
Recent reductions in charges have lowered the cost of a three-minute conversation between New York and London, and New York and Buenos Aires, to $30. A slight additional charge is made for calls between more distant points.

Transatlantic telephone service has won an important place in international communication. It has brought the factor of *personality* to the daily contacts between the Old World and the New. It is a furtherance of the Bell System's aim: *that you may be able to talk with any one, anywhere, at any time.*

AMERICAN TELEPHONE & TELEGRAPH CO. BELL SYSTEM AND ASSOCIATED COMPANIES

DANGER SIGNALS EVERY 60 FEET

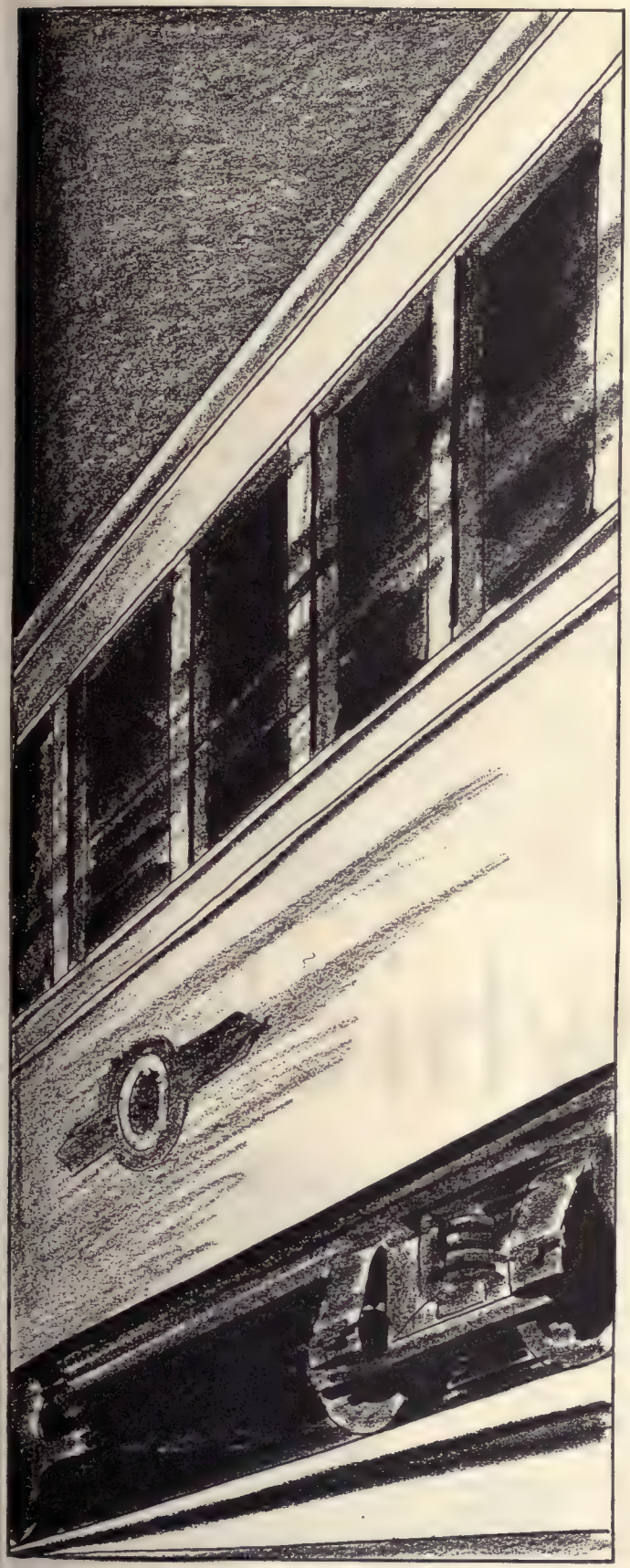
Rough spots at every joint . . . cupped spots on each receiving rail . . . broken bonds . . . holes in pavement . . . more expense for repairs and patch work . . . slowed-up schedules. Makes the railway unpopular with everybody.



THERMIT

METAL & THERMI

Pittsburgh Chicago Albany 120 BROADWAY



OR CLEAR TRACK ALL THE WAY

Perfect alignment . . . evenly-surfaced track . . . smooth-riding . . . better speed. No repairs required for rail or pavement . . . permanent! That's the modern way of railroading with Thermit-welded track.

Thermit welding rails both for maintenance and new construction is the recognized standard on hundreds of systems. Information and cost data on request.

THERMIT

CORPORATION

NEW YORK, N.Y. South San Francisco Toronto



That "PLUS" which is



TIMKEN



TIMKEN . . .

Under trolley buses as in all vehicles used in passenger-revenue-transportation, Timken Axles deliver a "plus" service—and "plus" satisfaction.

In strength, long life, high efficiency, dependability, low operating cost—there's always a "plus"; because the axles are Timken.

And when it comes to quietness, there's nothing approaches Timken Worm Drive.

Front and rear—let the axles be Timken.

THE TIMKEN-DETROIT AXLE CO., DETROIT, MICH.

Worm Drive AXLES

TA CO

Congratulations

Of the 5 recently announced winners of the B. T. Maintenance Awards . . .

4 use

Cities Service Koolmotor Products exclusively or in part . . .



This is an outstanding tribute to the tried and proved quality and economy of Cities Service petroleum products.

These dependable oils and greases will deliver prize-winning performance, day after day, in your fleet. Thousands of bus operators have found them a sure means of lowering maintenance and operating costs.

On request, a Cities Service engineer will call, study your lubrication requirements and recommend the correct grade of Cities Service lubricants.

CITIES SERVICE COMPANY

60 Wall Street New York City

KOOLMOTOR PRODUCTS

to the winners!

CLASS A

1st Award Class A. United Electric Railways Company*
Providence, R. I.

2nd Award Class A. Community Traction Company*
Toledo, Ohio

CLASS B

1st Award Class B. The Blue Ridge Transportation Company*
Hagerstown, Md.

2nd Award Class B. Washington Rapid Transit Company*
Washington, D. C.

CLASS C

1st Award Class C. Groton & Stonington Traction Company*
New London, Conn.





SPECIALS IN TRACKWORK BY

LORAIN

GIRDER RAILS
GIRDER GUARD RAILS
PLAIN GIRDER RAILS
RAIL JOINTS AND TRACK ACCESSORIES
EXPANSION JOINTS FOR ELECTRICALLY WELDED TRACK
SPECIAL TRACKWORK
SWITCHES, FROGS AND CROSSINGS
in
Solid Manganese Steel, Manganese Insert Construction, Chrome Nickel Steel Insert Construction and Built-up Construction of all heights and weights of rail.

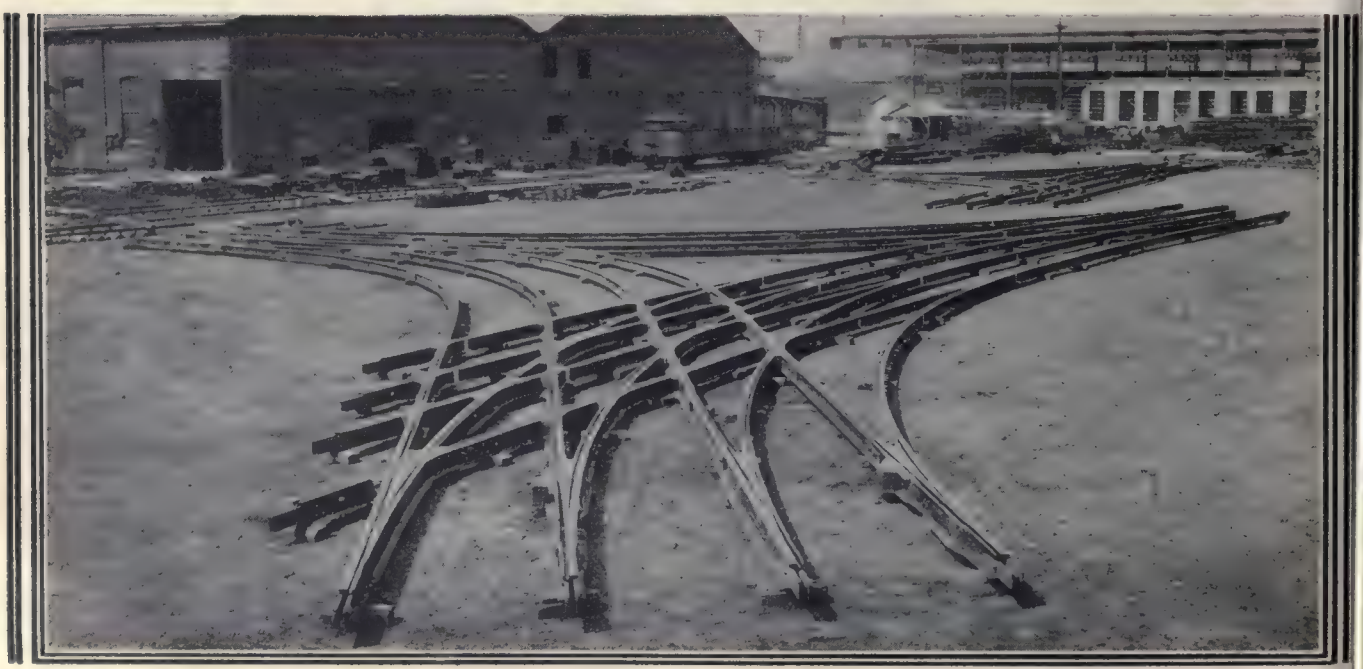
LORAIN'S ability to meet your special track-work needs is limited neither by experience nor facilities. In the LORAIN complete line there are many modern developments which offer the most effective solution to usual and unusual layout problems. *Investigate.*

THE LORAIN STEEL COMPANY

General Offices: 545 Central Avenue, Johnstown, Pennsylvania

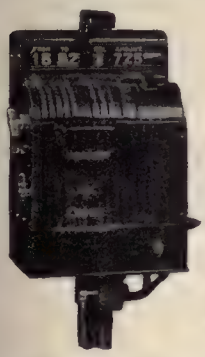
Subsidiary of United States Steel Corporation

Sales Offices: Atlanta Chicago Cleveland Dallas New York Philadelphia Pittsburgh
Pacific Coast Distributors: Columbia Steel Company, Russ Bldg., San Francisco, Calif.
Export Distributor: United States Steel Products Company, 30 Church St., New York City, N. Y.



OHMER PRODUCTS FOR TRANSPORTATION

As a result of more than thirty-one years of successful development experience, Ohmer now produces many types of registers and recording devices designed to fill the varying needs of the railway, motorbus, motor transport and taxicab industries. We present a few Ohmer products which have gained world wide distribution.



Ohmer Ticket-Printing Register, Type 80



Ohmer Counting Register, Type 82-B



Ohmer Counter, Type 86-A



Ohmer Printing Fare Register, Type 3



Ohmer Taximeter, Type 99



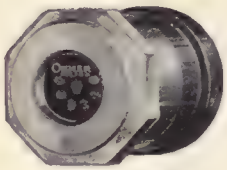
Ohmer Printing Taximeter, Type 38



Ohmer "Atco" Taximeter, Type AT



Ohmer-Kienzle Vibracorder, Type V-7



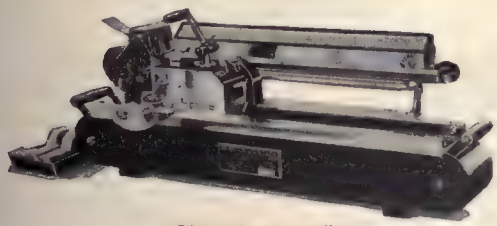
Ohmer Hub-Odometer, Type H



Ohmer Odometer, Type 76G



Ohmer Recordograf, Type 2R



Ohmer Ticket Office Ticket Printer, Type 232



Ohmer Ticket Office Cash Register, Type 800



Ohmer Rapid Ticket Printer, Type 233

Let us give you complete information about such of these products as may be of special interest to you. Without obligation, Ohmer Sales Engineers are ready to make a study of your particular problems and to suggest the types of registers and recording devices best suited to your needs. This service will insure the most complete protection of your income as well as the greatest efficiency in the operation of your cars, buses, trucks and taxicabs.

OHMER FARE REGISTER COMPANY DAYTON OHIO, U.S.A.

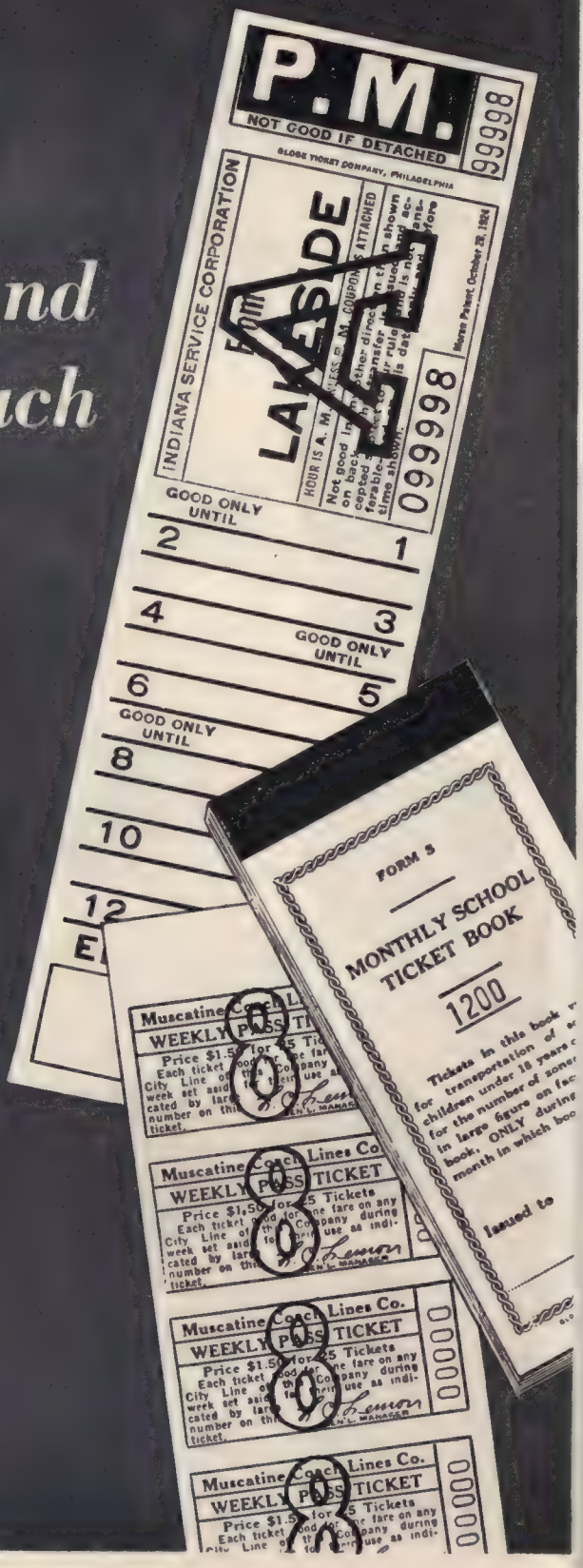
NO DOUBT ABOUT IT . . .

Correct transfers cut minutes from schedules . . . add dollars to net . . . and "double-check" each fare

It is but natural that a transfer series, designed for the exclusive use of a railway or bus property, should greatly reduce revenue leaks, avoid fraud, and speed up traffic.

The proof is on file. Many operating companies are saving thousands of dollars yearly with Globe-designed ticket-transfer systems.

Don't try to do the whole job alone. *Let our experienced men help you.*



Globe
TICKET COMPANY

112 North Twelfth Street
PHILADELPHIA

Additional Factories in

Los Angeles Boston New York Jacksonville

Sales Offices

Baltimore Cincinnati Cleveland Pittsburgh Syracuse

..FOR THE..
..UTMOST..
..IN CAR..
..COMFORT..

UTILITY

Heating and
Ventilating
Equipment for
Electric and
Steam
Railway Cars
Trackless
Trolleys and
Buses

RAILWAY UTILITY CO.
CHICAGO, ILL.


DODGE
LONG
LONG PRODUCTS
Automotive
Clutches and Radiators
LONG MANUFACTURING COMPANY, DETROIT, MICHIGAN

IN these 25 major cities of 250,000 to 7,000,000 population—comprising over 20 per cent of the total population of the United States and serving the transportation needs of over 25 million people—*there are 4,699 Yellow Coaches in regular revenue service.*

Here, in these dense centers of population, the investment in Yellow Coaches totals over 40 million dollars.











Over 80 per cent of Yellow Coach sales are to repeat buyers



The proof that equipment has passed the acid test can be found in its records of consistent re-orders









rving 25 million people

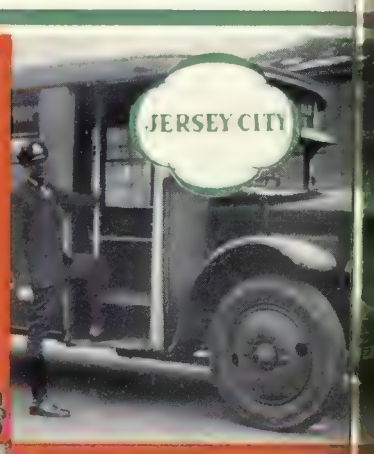
YELLOW COACHES

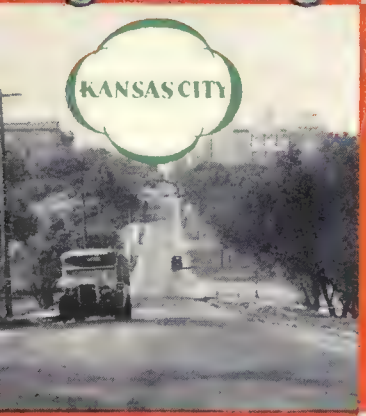
IN the 25 principal cities of the United States, 4,699 Yellow Coaches are in regular revenue service. Such nation-wide acceptance of Yellow equipment for large city service is conclusive evidence of satisfactory performance. No other company can point to such overwhelming preference. Yellow Coaches lead in large city service by such a wide margin that there is no basis for comparison.











There's a Yellow Coach for every class of service



Behind plant and machinery are divisions of transportation and engineering research dedicated to the progress of highway transportation









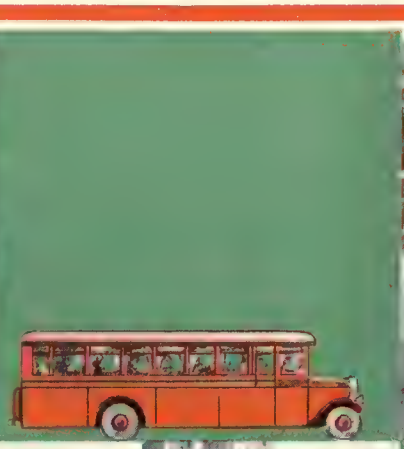
4,699 in 25 major cities

YELLOW COACHES

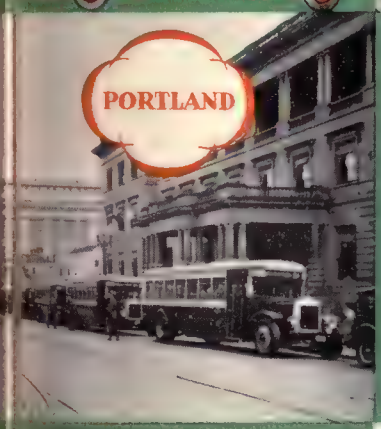
IN these great population centers Yellow Coaches are daily forced to meet every kind of transportation problem. The varying transportation needs of these great crowded communities involve many serious problems of mass and class transportation, many wide differences in operating conditions, many tremendously important economic considerations. Yellow has met these varying problems by providing a specially designed coach for every class of service.











Yellow Coaches are made in one of the largest and most efficient plants in the world, devoted to the production of highway transport equipment



A coach can be judged by the company it keeps









A coach for every class of service

YELLOW COACHES

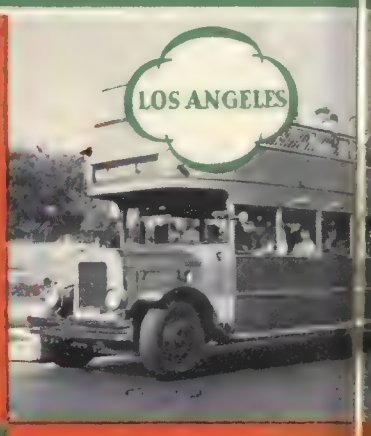
IN these 25 large metropolitan centers Yellow Coaches have been subjected to performance tests without parallel in this country. 25 million people, dependent on the choice of local operating companies for reliable low cost transportation, support Yellow Coaches and by their expressed satisfaction have made bus operation both popular and profitable.

Yellow equipment has had to be good to secure such widespread acceptance. In no other way can its popularity with riders and operators alike be explained.











There can be only one explanation of why so many important transportation systems all agree on Yellow Coaches



Repeat orders built this fleet of 4,699 Yellow Coaches









GENERAL MOTORS TRUCK CO.

Subsidiary of Yellow Truck & Coach Mfg. Co.

PONTIAC, MICH.



The new 30-passenger de luxe coach of Public Service Coordinated Transport; 168 of these bodies are being built on Yellow "250" chassis in the Plankroad shops of the operating company at 703 Ferry St., Newark, N. J. They are to be operated on routes between New York, Philadelphia and New Jersey cities. The body construction differs from the usual, following closely the Public Service city-type bus but with changes to adapt the coach for de luxe express service.

New *de luxe* Coach of Public Service of N. J. *has new comfort feature—*

PUBLIC Service Coordinated Transport is building in its Plankroad shops in Newark, N. J., 168 new de luxe coaches for express service. Some of these coaches are already completed and in service between New York, Philadelphia and New Jersey cities.

These new coaches embody every comfort possible for the passenger and represent the latest in de luxe coach design. One of the new features, of interest to every motor bus operator, is the use of Johns-Manville Insulation in the roof construction.

This insulation, which is specially adapted to the purpose, increases passenger comfort in two ways. It deadens the noise created by vibrating roof sheets before it reaches the ears of the passengers. It keeps the coach interior cooler in summer and warmer in winter by retarding the passage of heat through the roof.

The Johns-Manville Insulation is easily applied between the outer and inner roof as shown in the picture below. In actual operation, this simple and inexpensive feature has proved to be a highly desirable and necessary aid to passenger comfort.

For many years J-M Insulation has been standard equipment on the steam railroads. Its adoption by electric railways and motor coach operators is growing rapidly to meet the higher standards of today set by a travelling public that demands every reasonable comfort. The facts about J-M Insulation including construction details for both motor coaches and electric railway cars can be had by writing to Johns-Manville, 292 Madison Avenue, New York, N. Y.



This photograph shows simple application of the Johns-Manville Insulation. The insulation is held in place by tape-tacking to trim sticks.



This photograph shows the aluminum ceiling panels put in place after the installation of the Johns-Manville Insulation.



THESE 100% SOCONY BUSES KEEP OPERATING EXPENSES LOW

THE Nashua Transportation Company—a division of the Nashua, N. H., Street Railway Company—runs five of these splendid buses for special trips, and in and around Nashua. They are fueled and lubricated 100% with Socony products.

Fleet owners do not change, once they have tried Socony products. They find that operating expenses stay low while performance is always high.

Why not join these satisfied fleet owners? You will find—as they have found—that Socony has an answer in terms of economy and efficiency to every gasoline and lubricating problem.

SOCONY

BANNER GASOLINE SPECIAL GASOLINE *plus* ETHYL

MOTOR OIL AIRCRAFT OIL

STANDARD OIL COMPANY OF NEW YORK

WHAT ABOUT YOUR TROLLEY POLES?

IN planning for greater efficiency in electric railway operation, the matter of trolley poles should be given careful consideration. When figuring the cost of service it will be well to study the construction of the trolley pole—what it can do from day to day in keeping down delays, avoiding traffic tie-ups and eliminating frequent replacements.

NATIONAL-SHELBY Poles are designed with sufficient strength to meet all service requirements and yet not be of excessive weight and are, therefore, economical. A special form of reinforcement at the proper place gives the pole great strength, while the grade of steel used and a special heat treatment after drawing give a high elastic limit and assure long life and satisfactory service.

In addition, every NATIONAL-SHELBY Trolley Pole is individually tested before it leaves the mill—a form of test that approximates actual service conditions. This type of test is especially important in that it minimizes the possibility of any defective pole being installed—thereby helping to cut the cost of trolley pole service before it begins. A description of this test and complete information about these poles will be sent on request.



NATIONAL SHELBY

NATIONAL TUBE COMPANY

Frick Building, Pittsburgh, Pa.

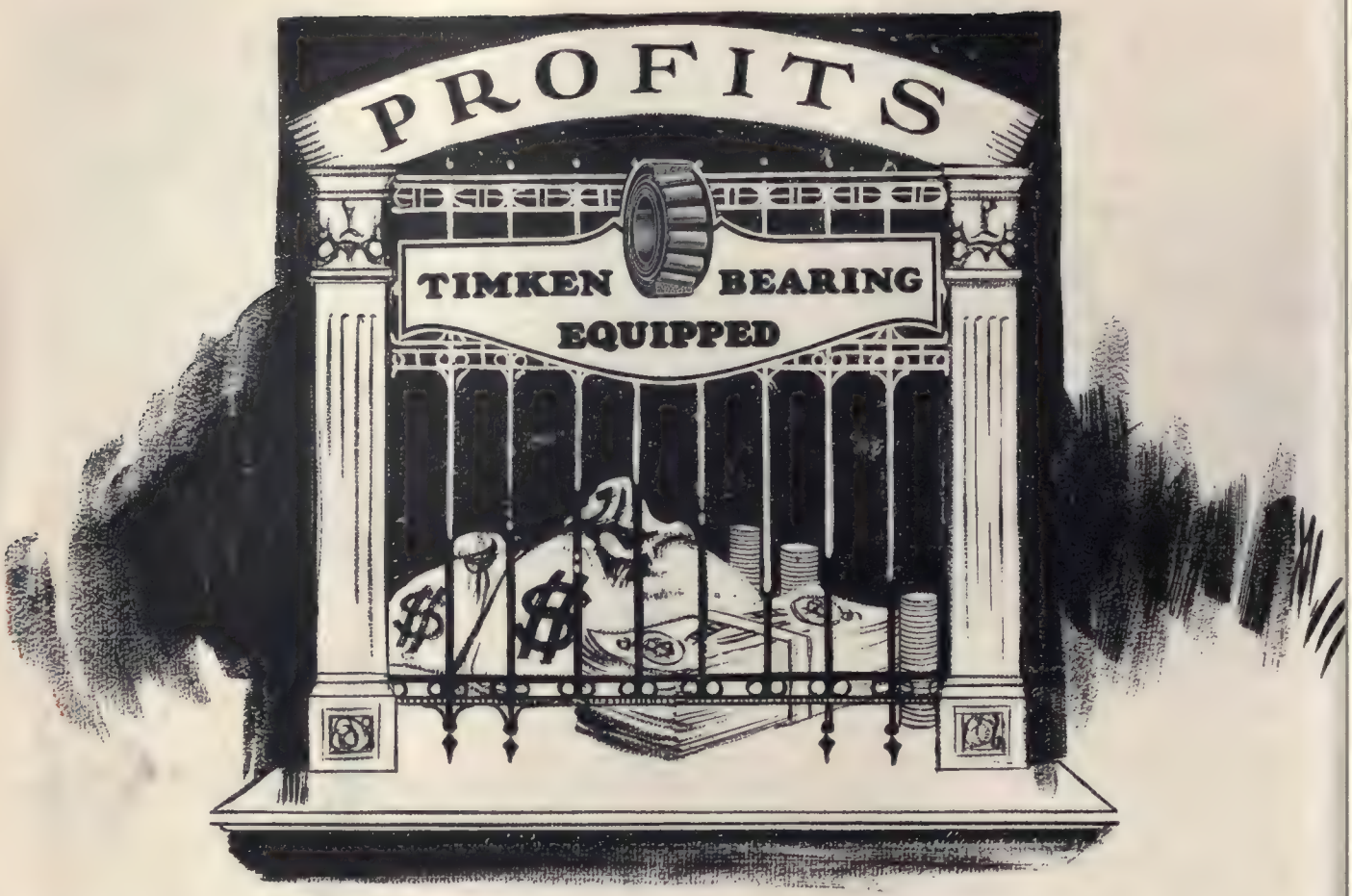
QUALITY PRODUCTS — Dependable Service

SUBSIDIARY OF UNITED STATES STEEL CORPORATION

PRINCIPAL SUBSIDIARY MANUFACTURING COMPANIES

American Bridge Company
American Sheet and Tin Plate Company
American Steel and Wire Company
Carnegie Steel Company
Columbia Steel Company
Cyclone Fence Company
Federal Shipbuilding and Dry Dock Company
Illinois Steel Company
National Tube Company
The Lorain Steel Company
Tennessee Coal, Iron & R. R. Company
Universal Atlas Cement Company

Pacific Coast Distributors—Columbia Steel Company, Russ Building, San Francisco, Calif. *Export Distributors*—United States Steel Products Company, 30 Church Street, New York, N. Y.



Protection *for* Street Car Profits

Are excessive operating and maintenance charges plundering your profits? When allowed to go unchecked, these items make serious inroads into street railway revenues. Hence the necessity of reducing them to the lowest possible figures.

The use of Timken Bearing Equipped cars is one cost-cutting method which electric railway companies are employing with great success. Is your company one of them?

It takes considerably less power to start and propel a Timken-equipped car, and the reduction in daily power demands on systems operating these cars represents a big saving.

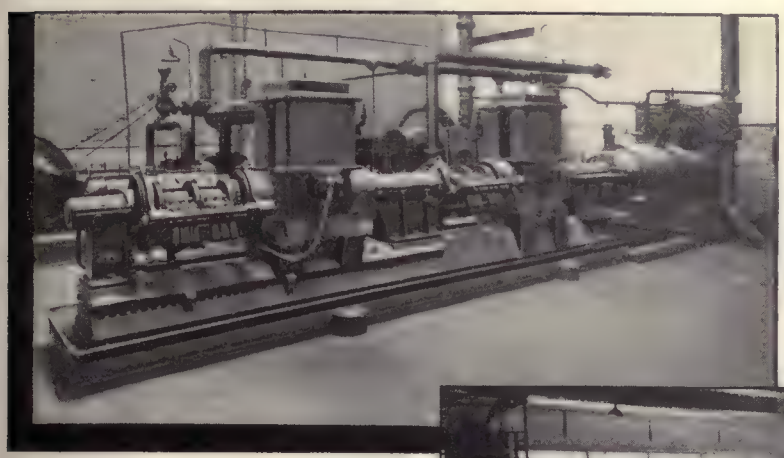
The same feature which is responsible for this power economy—friction elimination—also results in greatly lowered lubricating expense, both as to cost of labor and material.

Burned out bearings become things of the past, and because Timkens carry the heaviest radial, thrust and combined loads as effectively as they abolish friction, continuity of car service is increased and shopping periods minimized, thus slashing maintenance costs to the bone.

Car builders will cooperate to the fullest extent in putting these Timken benefits to work in your favor. The Timken Roller Bearing Company, Canton, Ohio.

TIMKEN *Tapered Roller* **BEARINGS**

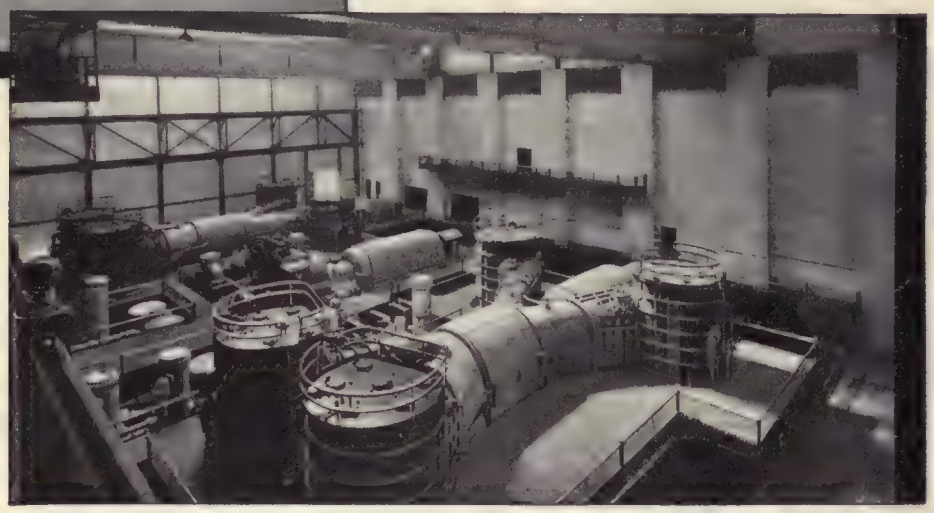
from 350 k. w. to 208,000 k. w.



Hardly yesterday, it seems, every one was mighty proud when this 350 K. W. Parsons Turbine-driven Generating Set was brought over from Newcastle-on-Tyne, England, and installed with its copper leaf brushes. Yessir—two 700-ampere, 250-volt dynamos.

■

But today! Here is a recent installation of a generating layout with a capacity of 208,000 K. W. (A 76,000 K. W. high-pressure unit and two 62,000 K. W. low-pressure units, each with a 4000 K. W. house generator.) And no "ridging" by copper leaf or wire gauze brushes, today! Modern installations use brushes of carbon or of metal-graphite composition.



ONE of the clearest examples of America's rapid progress in serving society is found in the steady, evolutionary development of electrical power-generation.

Above, a unit of 350 K. W., *made and used during the past century*, now occupies a place of honor and curiosity in a museum.

And beneath it a modern electric generating installation, at the State line station, Indiana . . . a magnificent monster humming as silently smooth as a hummingbird's wings . . . speeding, when exerting itself, 208,000 K. W. to the needs of its territory.

Just as developments in capacity have increased along the path of electric production in recent years—so has progress brushed its way along, from copper leaf and wire gauze brushes to brushes of carbon and of metal-graphite composition. Easier on commutators—quieter, smoother action—more economy.

You are always assured that the research facilities of National Carbon Co., Inc., will provide National Pyramid Brushes to meet the demands of each step along the path of development in electrical industry.

Systematic inspection and maintenance of brushes, commutator and brush holders insure longer brush life, more satisfactory performance and greater machine efficiency.

To avoid expensive shut-downs, anticipate your requirements for replacement brushes.

NATIONAL CARBON COMPANY, INC.

Unit of Union Carbide and Carbon Corporation

Carbon Sales Division — SILVER STRAND CABLE TRADE MARK REGISTERED — Cleveland, Ohio

Branch Offices and Factories

New York Pittsburgh Chicago Birmingham San Francisco

The SAFETY CAR CONTROL EQUIPMENT

◆ ◆ ◆ INCREASES Safety of Operation

INTERLOCK feature permits centralized operating responsibility . . . prevents opening of doors before car stops, or starting of car before doors close . . . and causes an emergency brake application if controller handle is released due to motorman's negligence or disability while car is in motion.



SAFETY CAR DEVICES CO.
OF ST. LOUIS, MO.
Postal and Telegraphic Address:
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CHICAGO SAN FRANCISCO NEW YORK
WASHINGTON PITTSBURGH



that qualify for ANY service

No matter how exacting your service conditions may be, Carnegie Wrought Steel Wheels will more than measure up to your requirements. They are built to withstand the stress of modern traffic—peak loads, rapid acceleration and emergency stopping. The rolling and forging process by which they are manufactured imparts to the steel exceptional strength and endurance—exceptional safety.



Carnegie Wrought Steel Wheels have long been accepted as the standard of excellence under railroad passenger cars, where the service is severe and where utmost safety precautions are taken. Under electric cars they render the same safe, trouble-free, economical service. Before you invest in wheels, investigate the many advantages of Carnegie Wrought Steel Wheels.

CARNEGIE STEEL COMPANY · PITTSBURGH, PA.

Subsidiary of United States Steel Corporation

91

CARNEGIE

WROUGHT STEEL WHEELS

Extensive system of

NATIONAL ELECTRIC POWER CO. *operates*

3,000,000 miles a year on Goodrich





SCRANTON BUS CO.



LEWISTON TRANSPORTATION CO.



ALTOONA—LOGAN VALLEY BUS CO.

THE National Electric Power Company owns and controls the following bus properties throughout the Eastern and Southeastern parts of the United States:

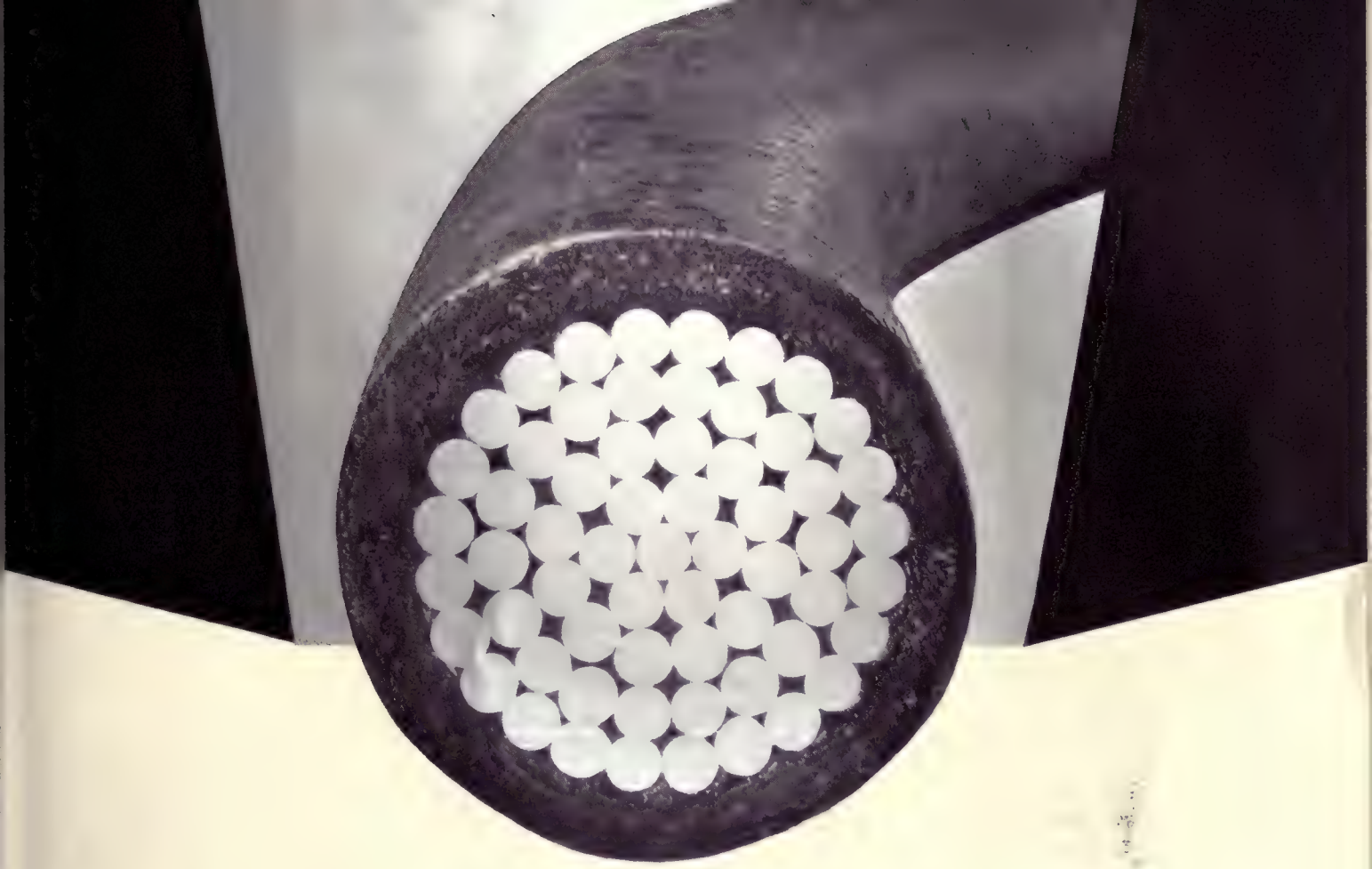
Altoona—Logan Valley Bus Co., Altoona, Pa.
Citizens Traction Company (Keystone Public Service) Oil City, Pa.
Citizens Rapid Transit Company (Virginia Public Service) Newport News, Va.
Lewiston Transportation Co., Lewistown, Pa.
Scranton Bus Co., Scranton, Pa.
Youngstown & Suburban Transportation Co., Youngstown, Ohio.

These extensive bus lines operating practically 3,000,000 miles a year, have rendered an outstanding service to millions of travelers. For the last four years these lines have been equipped with Goodrich, 100%.

The B. F. Goodrich Rubber Company, Established 1870, Akron, Ohio. Pacific Goodrich Rubber Company, Los Angeles, Calif. In Canada: Canadian Goodrich Company, Kitchener, Ont.

Goodrich HEAVY DUTY Silvertowns

SPECIFY GOODRICH ON YOUR NEW BUSES



All-Aluminum triple braid weatherproof cable

, , Cheaper in first cost , , over 50% lighter

Lower first cost is definitely provable. Alcoa Aluminum weatherproof cable gives the same electrical conductance yet is, unit for unit, over 50% lighter than other insulated cable.

In the matter of erection and maintenance, Alcoa Aluminum weatherproof cable brings substantial savings. It is lighter to handle, and easier to erect. Its use permits of lighter supporting structures when the feeder is carried over-head. When the feeder is carried underground, its light weight is even more of an advantage in making initial installations, additions or replacements.

Alcoa Aluminum triple braid weatherproof cable can be had in any size and for feeder potentials of any voltage.

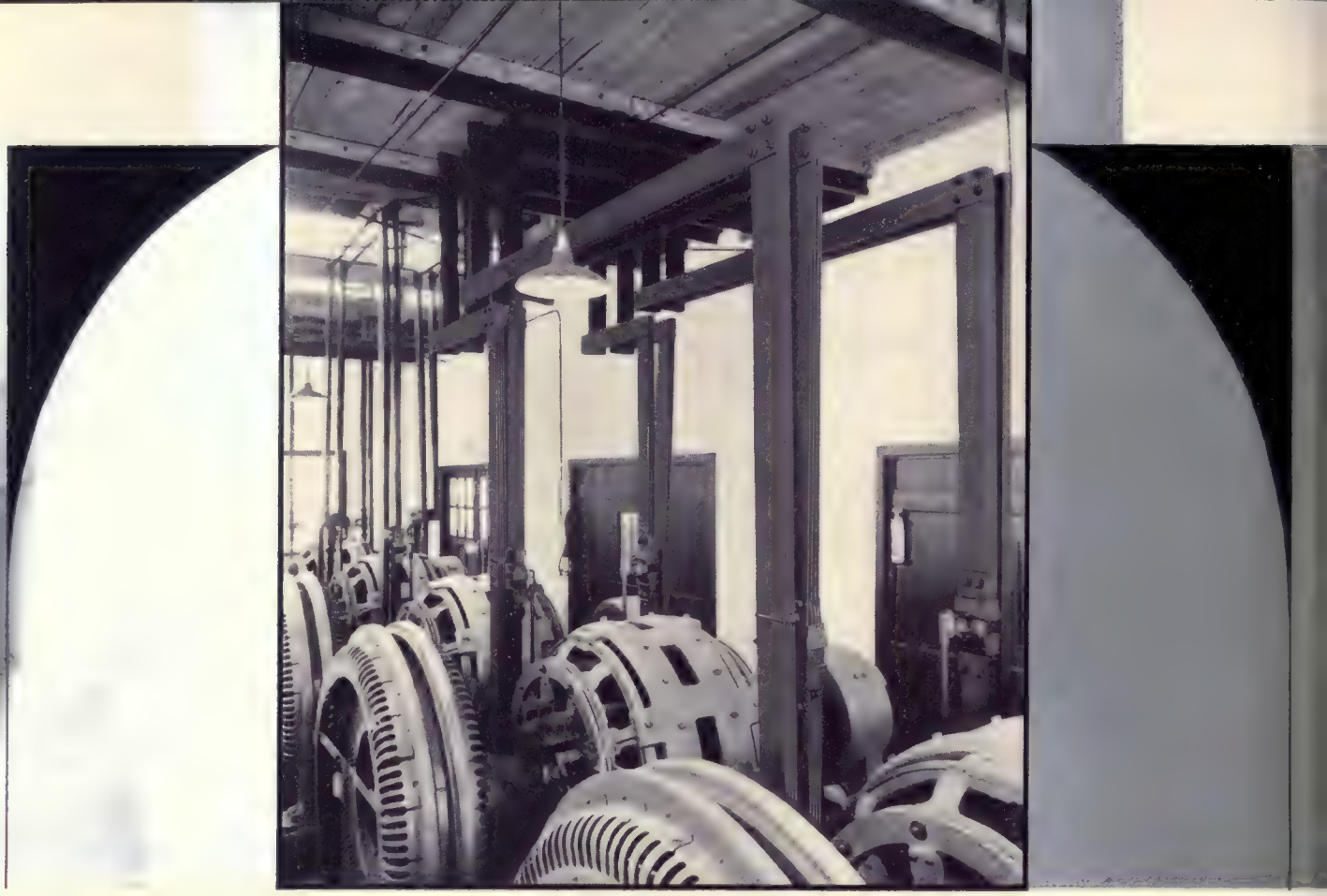
In addition to the insulated feeder cable we also supply bare All-Aluminum Feeder Cable for interurban lines. Here again the first cost of the aluminum cable is lower—its weight less by over 50% than other feeder cable. Those companies whose activities extend to the distribution of high-voltage current will be interested in A.C.S.R. (Aluminum Cable Steel Reinforced).

Let us send you the particulars of the various Alcoa Aluminum Cables. Address ALUMINUM COMPANY *of* AMERICA; 2463 Oliver Building, PITTSBURGH, PENNSYLVANIA.

ALCOA ALUMINUM

USED IN ALL-ALUMINUM TRIPLE BRAID WEATHERPROOF CABLE

ALCOA



, , , , Alcoa Aluminum Bus Bars also are cheaper in first cost , , over 50% lighter

With a marked saving in first cost, it is indeed no wonder electrical men everywhere are turning to the use of Bus Bars of Alcoa Aluminum. Weighing over 50% less than other bars commonly used, yet providing the same current carrying capacity, Bus Bars of Alcoa Aluminum require lighter supporting structures. As this picture shows, their use in many cases does away with the need of intermediate supporting structures entirely. Longer spans are the natural corollary of these light weight bus bars.

Other advantages of Alcoa Aluminum Bus Bars lie in the fact that the work of bending and assembling is accomplished with ease. These bars also have a lower operating temperature.

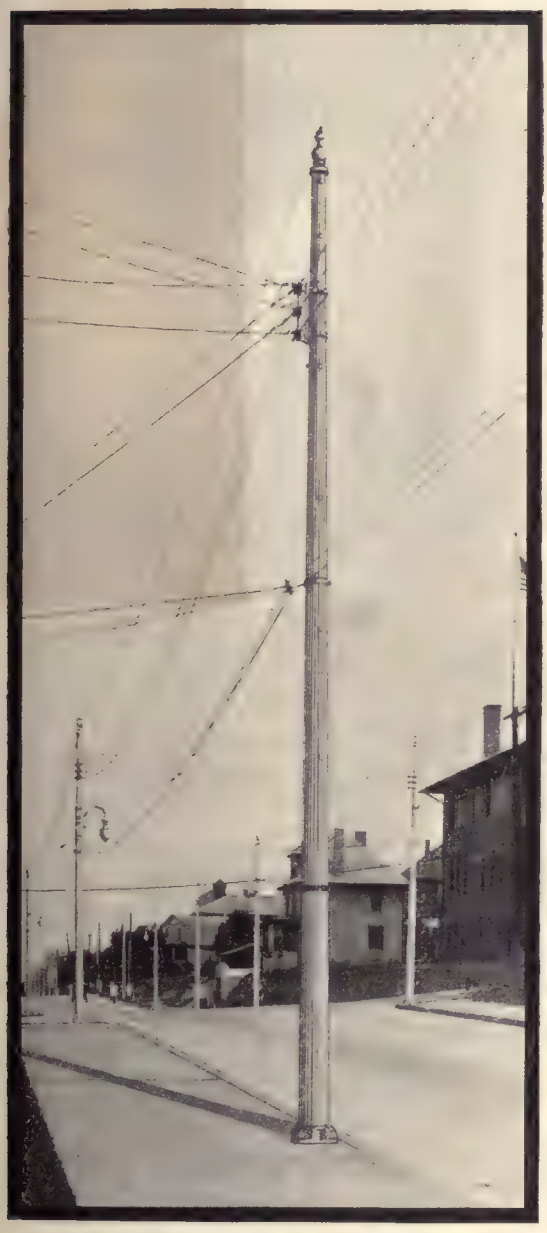
The cooperation of Aluminum Company of America representatives is available. Let us send you the booklet, "Aluminum Bus Bars"; it gives tables of weights, carrying capacities and other technical data. Address ALUMINUM COMPANY *of* AMERICA; 2463 Oliver Building, PITTSBURGH, PENNSYLVANIA.

ALCOA ALUMINUM

BUS BARS MADE OF

ALCOA ALUMINUM

BETTER POLE LINES



Union Metal 30-foot poles installed at Ambridge, Pa., by Duquesne Light Co.

are being built with

Fluted Steel Poles

WITH Fluted Steel Poles, utilities are building better lines than ever before—better from the standpoint of appearance, service and long life.

A recent installation of these poles at Ambridge, suburb of Pittsburgh, demonstrates their advantages. The poles there carry the secondary lighting distribution circuits, street lighting brackets and other services. Alternate poles carry a G. E. pole top IL transformer. No underground construction was necessary as street lighting circuits are carried inconspicuously overhead. All poles are painted with aluminum and equipped for detachable pole steps.

The installation is neat and trim. Poles are aligned perfectly. After ten, fifteen or fifty years, the poles will still retain their fresh, original appearance and the same qualities of strength and flexibility which make them so desirable today.

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GENERAL OFFICES AND FACTORY ◆ CANTON, OHIO

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For the UNITED STATES STEEL CORPORATION
and its Subsidiary Manufacturing Companies



THE Subsidiary Manufacturing Companies of the United States Steel Corporation hold in common this simple ideal of service—constantly to seek improvements for their products, and to make these products available on a basis that assures a full measure of value. The new mark here introduced to you stands for this ideal of service and is a sign of quality. In future advertising and promotion work, it will be used in connection with the well known symbols of this Company.

American Steel & Wire Company

208 South La Salle St., Chicago 30 Church St., New York
And All Principal Cities

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ANOTHER GREAT TRANSPORTATION COMPANY FINDS ECONOMY IN BALANCED PERFORMANCE

The motor coaches of a midwestern transportation company travel nine million miles a year. Operating on such a large scale, the company naturally watches costs closely, and their motor coaches are run as economically as any in the country.

One of the cost-reducing methods adopted by this company was to standardize on Red Crown Gasoline and Polarine Motor Oil. A check-up of costs has shown real economy in the balanced performance these products give.

Red Crown Gasoline and Polarine Motor Oil have been refined especially to give balanced performance, to work with that harmony essential to efficient service and low cost operation. Red Crown burns clean . . . gives power and mileage. Polarine is rich and sturdy . . . supplies thorough, effective lubrication to the motor.

Try this combination in one of your motor coaches. You will find the combined operating cost of Red Crown and Polarine lower than that of any other fuel and motor oil.

STANDARD OIL COMPANY (*Indiana*)

General Offices: 910 South Michigan Ave., Chicago, Ill.

208-A

RED CROWN ETHYL GASOLINE

New— POLARINE MOTOR OIL



—PRODUCTS—

Wrought Steel Wheels

Armature Shafts

Springs and Axles

What is it that you desire in wheels?

Safety—

Elimination of broken flanges and flats—

Increased mileage—

Low maintenance costs—

"Standard" Wrought Steel Wheels will meet these requirements.

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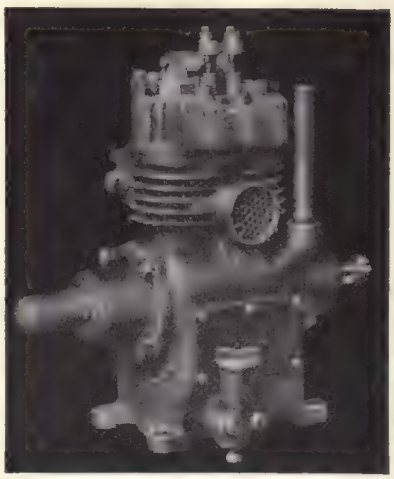
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Automotive
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Crowded highways, jumbled city traffic, unprecedented speed of today's super transport vehicles, modern standards of economic transportation . . . All have contributed to the never equaled popularity of the sure, quick, effortless action of the power brake. Never before has the demand for Bendix-Westinghouse Automotive Air Brakes been so pronounced. As evidence of the trend prominent commercial fleet operators everywhere have standardized on Bendix-Westinghouse Brake Control. They have learned the economy of a perfect stopping force and, when purchasing new units, are rigidly specifying Bendix-Westinghouse equipment in those few instances where the system is not standard. The trend is permanent and its growth apparent with the future evolution of the heavy duty vehicle. Today's Bendix-Westinghoue Automotive Air Brake offers a perfect balance for modern speed and power with a wide margin of reserve for tomorrow's development. The remarkable effectiveness of the Bendix-Westinghouse Brake is not an accident but, rather, the result of sixty-one years' deliberate research, development and manufacture of power braking equipment . . . the recognized safety standard of the world.



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6280

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Automotive Air Brake Co.
PITTSBURGH - - PENNSYLVANIA



Triple HEAT TREATED

THE Davis Wheel owes its unusual «One-Wear» qualities to the triple heat treatment of a special composition steel. The heat treated alloy steel of the Davis Wheel permits the manufacture of a light wheel with a resilient plate, a stronger wheel and one whose «One-Wear» principle reduces operating costs per wheel mile » » » » » » »

AMERICAN STEEL FOUNDRIES

NEW YORK CHICAGO ST. LOUIS

Nothing takes the place of leather

—for low-cost seat maintenance

General Leathers meet every requirement for low maintenance cost.

. . . they withstand the severest kind of service because they are tanned for durability.

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. . . they maintain that fresh, rider-attracting appeal because their colors stay fast.

For your new buses, electric cars and taxi cabs, specify General Leathers for seat coverings—and forget the cost of maintenance. On quantity orders we can cut directly from your patterns and thereby eliminate waste.

A wide variety of colors is available. Send for samples.



For bus seat coverings we offer our following specialties

Majestic Full Grain Leathers
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America's Largest Producers

GENERAL LEATHER COMPANY

Makers of Famous Tried and Proven "00" Leathers

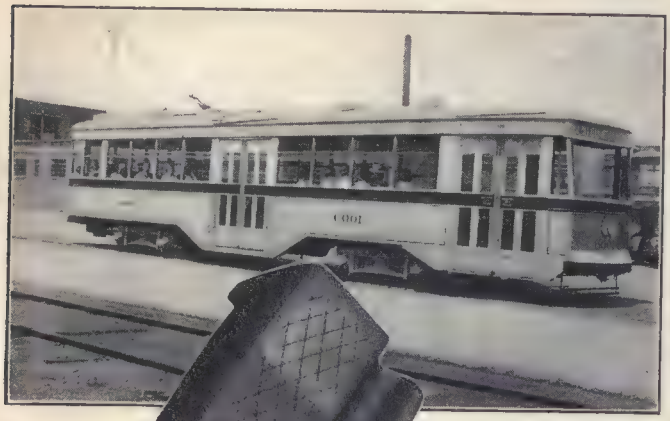
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For Higher Speeds



For The United Railways and Electric Company of Baltimore 100 of these cars are being built by the J. G. Brill Company. "Diamond-S" brake shoes are standard equipment on these cars.



and Quicker Stops

Car manufacturers are busy making new street railway equipment with bigger motors and stronger brakes. The demand for fast pickup, higher running speeds and quick stops is increasing the loads on brake shoes. Shoes must be of a type that will not disintegrate from over-heating nor wear away too readily.

The economy of "Diamond-S" brake shoes in electric railway service is due to their special features of construction which prevent disintegration from heat and make them wear longer than ordinary brake shoes.

"DIAMOND-S" BRAKE SHOES

The American Brake Shoe and Foundry Company

230 Park Ave., New York

332 So. Mich. Ave., Chicago



. . . whetstones that will sharpen your judgment!

PUBLIC UTILITY executives will find this collection of actual cases on significant phases of public utility management of unusual interest and value. Primarily designed for educational training, the cases present for analysis and decision a wide variety of problems just as they arose in actual utility companies. Since no solutions are given, the cases offer definite challenges to your powers of analysis and decision—serve as *whetstones* to sharpen executive judgment.

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II. Valuation, Depreciation and Fair Return.
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Illinois Steel Company

Subsidiary of United States Steel Corporation

General Offices:

208 South La Salle Street, Chicago

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CHECK WITH *Experience of* TRACTION EXECUTIVES



Close-up of brick surface from Connecticut Ave., Experimental Road, Chevy Chase, Md., which was built over 17 years ago by the U.S. Bureau of Public Roads. In this test Brick has shown the lowest maintenance cost of all pavement types.

ENGINEERS for electric railway companies have long used vitrified brick as standard pavement for track areas.

Now, an important Government test has shown Brick to have the lowest maintenance cost of all pavement types.

And, of course, brick has unique advantages for track pavement in that it absorbs vibration with minimum damage and allows ready access to the substructure.

For additional information on Brick Pavements and engineering data on their adaptability for paving track areas, address National Paving Brick Manufacturers Association, 1245 National Press Bldg., Washington, D. C.

VITRIFIED

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ELECTRIC CAR-HEATERS

THERMOSTATIC CONTROL

STEAM HEATERS FOR BUSES

COMPLETE PNEUMATIC DOOR AND STEP OPERATING EQUIPMENT

HIGH & LOW VOLTAGE BUZZERS & BELLS

SAFETY SWITCHES

SAFETY SWITCH PANELS



CONSOLIDATED CAR-HEATING CO., INC.

NEW YORK ALBANY CHICAGO



JOHNSON FARE COLLECTING SYSTEMS

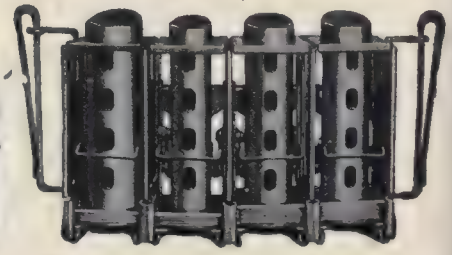


Johnson Electric Fare Boxes and overhead registers make possible the instantaneous registering and counting of every fare. Revenues are increased 1½ to 5% and the efficiency of one-man operation is materially increased. Quicker boarding of passengers with resultant reduction in running time for the buses. Over 5,000 already in use.

When more than three coins are used as fare, the Type D Johnson Fare Box is the best manually operated registration system. Over 50,000 in use.

Johnson Change-Makers are designed to function with odd fare and metal tickets selling at fractional rates. It is possible to use each barrel separately or in groups to meet local conditions. Each barrel can be adjusted to eject from one to five coins or one to six tokens.



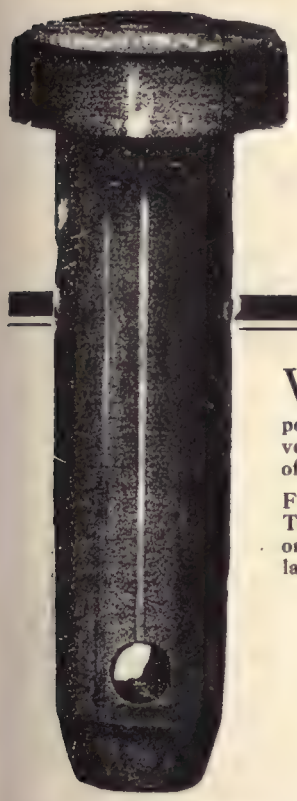


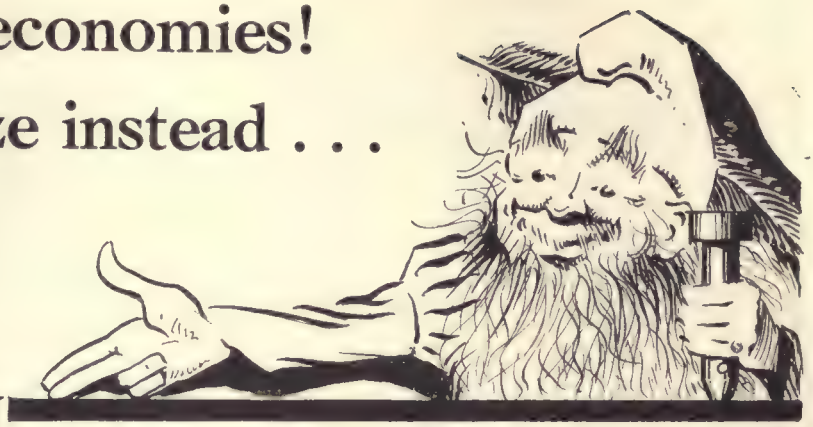
Johnson Fare Box Co.

4619 Ravenswood Ave., Chicago, Ill.

Beware of costly economies!

Boyerize instead . . .





WITH lower gross income prevailing on some properties, naturally there is a tendency to cut operating expenses wherever possible. But the far-sighted manager will approach this problem very carefully. He will cautiously weigh the "where's" and "why's" of any cuts which affect future maintenance.

For quality products such as Boyerized Parts, there is no substitute. They are a real economy. They last three or four times longer than ordinary parts. In addition they....1—Reduce replacements, 2—Cut labor costs, 3—and prevent break-downs.

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For greater safety at highway crossings is the "Union" HC-7 Highway Crossing Signal. Its backlight gives another indication which may be directed anywhere in the horizontal plane. This signal employs only one bulb for both indications. Write our nearest district office for more information.

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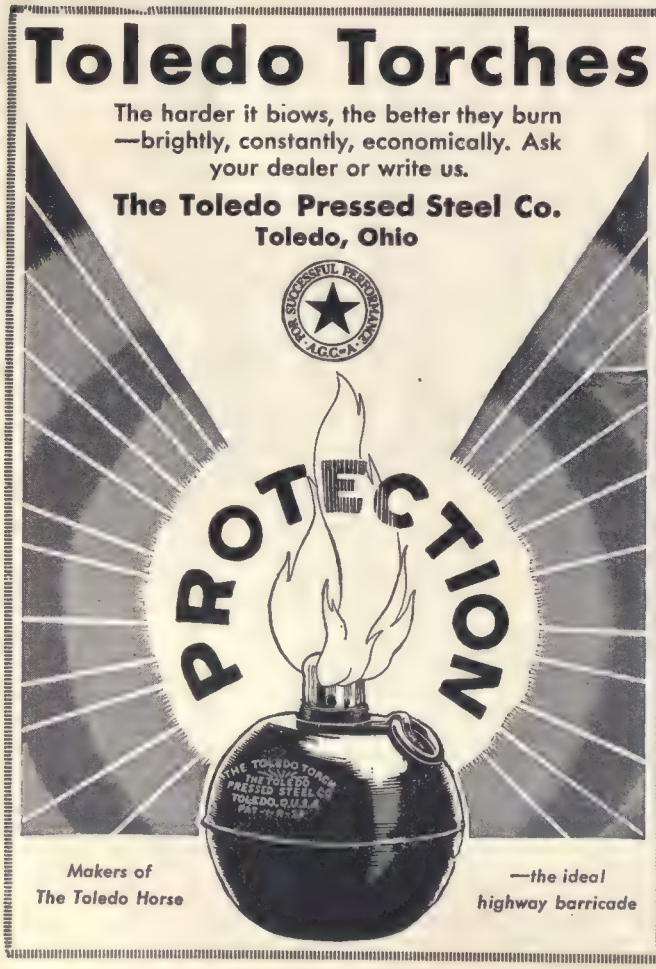
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are no longer a major item in Track Maintenance

PROPER design of crossings...to withstand the ceaseless pound of heavy loads under every service condition...has at last been determined by science.

No longer are roads forced to accept crossings developed by "cut and try" methods;...without exact knowledge of the stresses and strains imposed in service, and the proper design to resist them.

Science contributed the new Wharton crossing ...the only radical improvement in crossing design in generations. Progressive roads quickly adopted it, because the improved design materially lengthens crossing life, and cuts heavily into maintenance.

SEND FOR BULLETIN 1C



Patented July 6, 1926

No. 1591706

William Wharton Jr. & Co.
INC.
EASTON, PENNSYLVANIA

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YOU CAN SAFELY STANDARDIZE ON NATIONAL PRODUCTS

The next time replacement is up for consideration give full thought to National Products. The reasons are—economical service, long life, and greatly lowered maintenance costs. Our Engineering Department, because of its experience, can be of real benefit to you.

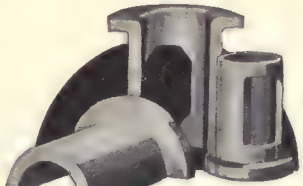
The Vigne Bimetallic Armature Bearing



An ideal combination of Bronze and Babbitt in alternating strips. This bearing will last longer, is stronger, will require less attention, and is less expensive. During test installations Vigne Bimetallic Armature Bearings have given 160,000 miles' service on the original application, and are still in good condition and in active use.



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"Tiger" Bronze Axle and Armature Bearings



"More-Jones" Trolley Wheels and Harps

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Meadville, Pa. Portsmouth, Va. St. Paul, Minn.

NEW IMPETUS . . .



Type EAS

Type EAS rail bonds are brazed to the rail using the portable welding furnace. The loop of these bonds may be offset at any angle, making the bond suitable for application to a wide variety of rail joints, including joints with heavily beaded splice bars. The Champion type is supplied with a heavy copper sheath that grips the strands beyond the zone of the weld. Either Champion or standard type are electrically efficient, "service-proven" bonds.

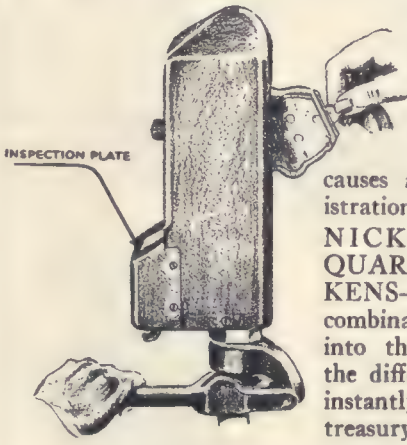
NEW motors, new drives, new designs in cars and equipment have given new impetus to the electric railway industry. Yet no matter how modern the equipment, if voltage is low its efficiency is seriously impaired.

To guard against low voltages, good rail bonds are vital. Regardless of the type of track construction there is an Erico Rail Bond to fit your requirements. All are noted for their ease of application and ability to secure the maximum efficiency from your return circuit.

Now, before Winter sets in, is a good time to check up on rail bonds. We will gladly co-operate and supply your needs promptly.

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2070 E. 61ST PLACE - - - - CLEVELAND, OHIO

Fare Collection,

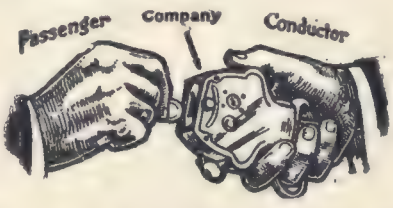


to avoid the old temptations and leaks, *necessitates the coin-slot mechanism.*

Coin - insertion causes *instantaneous* registration *by the patrons.* NICKELS, DIMES, QUARTERS or TOKENS—all or in various combinations, are paid into the *one* coin-slot—the different values being instantly assured your treasury.

MONEY METERS are furnished in either *portable* or *stationary* form and are mechanically unbeatable for trolleys and buses.

This *at-the-source* protection will probably add 4% to 10% to your present passenger income.



Money-Meters, Inc. (Successor to Rooke Automatic Register Co.)
3209 Book Tower, Detroit, Mich.

STUCKI SIDE BEARINGS

SPECIAL CARBON STEEL
HEAT TREATED

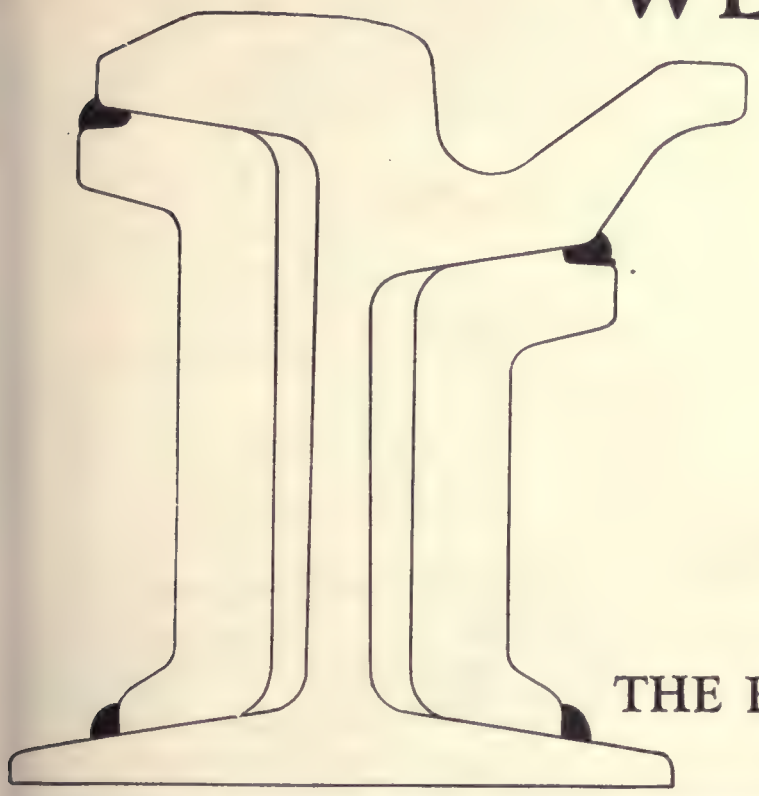


LARGE WEAR SURFACES
FREE ROLLER
ONLY TWO PARTS

A. STUCKI CO.
OLIVER BLDG., PITTSBURGH, PA.

Canadian Representative:
The Holden Co., Ltd., Montreal, Canada

"WELD PLATES"



For EFFICIENT, ECONOMICAL

JOINTS

Do you believe in statistics? Rely on performance records? If so, the performance records of the many "Weld Plates" now in use will convince you that they lead the bar-weld joints in efficiency and economy.

"Weld Plates" represent the most modern welding practice. They are the strongest and most up-to-date plates rolled especially for electric welded joints. Note the shape—the grooves for retaining plenty of weld metal along the upper edges—the wide contact areas at top and bottom—the suitability for the use of short bolts.

A trial will convince you of their efficiency and economy.

THE RAIL JOINT COMPANY

165 Broadway, New York



Roller - Smith Announces New Catalog No. G-48 on Switchboard Type Instruments.

The New Roller-Smith Catalog No. G-48 covers the entire line of Roller-Smith Switchboard Type Instruments:

Direct Current — Alternating Current
Thermo Couple — Instrument Transformers

All sizes of instruments from the small 3½" up to the Illuminated Dial are included.

This Catalog is in compact and convenient form. A copy should be in the hands of every man who is interested in any way in electrical measuring instruments.

Send for your copy of New Catalog No. G-48.

Over 35 years' experience is back of

ROLLER-SMITH COMPANY
Electrical Measuring and Protective Apparatus

MAIN OFFICE — WORKS
2140 Woolworth Bldg., New York — Bethlehem, Penna.
Offices in Principal Cities in U. S. A. and Canada

The GOODWILL of Your Passenger is Invaluable

. . . And there is no better builder of Good Will than the



MERGOTT

CARFARE CARRIER

Used by Traction Companies in 26 states and provinces.

Space for your advertising message on reverse side of carrier. Containers hold 12 tokens—compact, handy and economical. Let Mergott Carfare Carriers be part of your fall campaign for more and better satisfied riders.

Write now for samples, quotations and full particulars!

THE J. E. MERGOTT CO.
MANUFACTURERS
318 to 368 Jelliff Ave., Newark, N. J.



OKONITE PRODUCTS

Okonite Insulated Wires and Cables

Varnished Cambric Cables

Okonite Insulating Tape

Manson & Dundee Friction Tapes

Okocord

Okoloom

OKONITE CALLENDER PRODUCTS

Impregnated Paper Cables

Super-tension Cables

Splicing Materials

Dundee Tapes are Tenacious

IN the manufacture of Dundee friction tapes, the rubber adhesive compound is worked into the fabric under heavy pressure. This frictioning process makes the adhesive and the fabric inseparable, something which the ordinary method of spreading the adhesive on the tape cannot accomplish.

In service, Dundee tapes stick tenaciously in place and clearly demonstrate the superiority of the frictioning process.



THE OKONITE COMPANY
Founded 1878
THE OKONITE-CALLENDER CABLE CO., INC.

FACTORIES: Passaic, N. J. Paterson, N. J.

SALES OFFICES:
NEW YORK CHICAGO
PITTSBURGH ST. LOUIS
BOSTON ATLANTA
BIRMINGHAM SAN FRANCISCO
LOS ANGELES SEATTLE DALLAS

Novelty Electric Co.
Philadelphia, Pa.

F. D. Lawrence Electric Co.
Cincinnati, O.

Canadian Representatives:
Engineering Materials, Limited
Montreal

Cuban Representatives:
Victor G. Mendoza Co., Havana

PANTASOTE

TRADE MARK

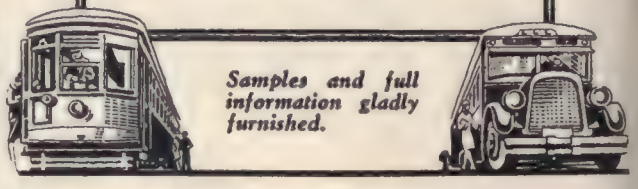
—the car curtain and upholstery material that pays back its cost by many added years of service. Since 1897 there has been no substitute for Pantasote.

AGASOTE

TRADE MARK

—the only panel board made in one piece. It is homogeneous and waterproof. Will not separate, warp or blister.

Standard for electric railway cars and motor buses



Samples and full information gladly furnished.

The PANTASOTE COMPANY, Inc.
250 Park Avenue NEW YORK

STOP Car Turns Right



That's the message flashed motorists by the Nachod Turn Right Signal . . . preventing serious side-swiping accidents . . . saving life and property. No law suits filed . . . no damages for the Railway Company to pay. Play safe. Install these ever vigilant automatic watchmen wherever street cars turn unexpectedly. Quotations Gladly Furnished on Request. Nachod & United States Signal Co., Inc., Louisville, Ky., Manufacturers of Block and Highway Crossing Signals.

NACHOD SIGNALS "Spell Safety"



TUCOLITH
FLEXOLITH

Long Wearing

Even the rough brogans of stamping workmen do not injure the hard, tough surface of Tucolith floors.

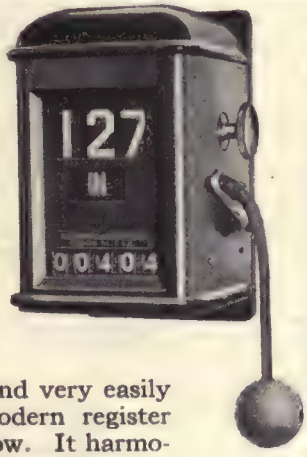
6 REASONS WHY

Tucolith is the popular flooring material for cars and busses.

1. Long Life
2. Attractive
3. Non-Slip Surface
4. Fireproof
5. Sound Deadence
6. Sanitary

TUCO PRODUCTS CORP.
30 CHURCH ST., NEW YORK
PEOPLES GAS BLDG.,
122 S. MICHIGAN AVE., CHICAGO

...a triumph of design



Light weight, low cost, long life, positive gear drive, and indestructible parts in this register are features made possible by forty years of fare register experience. Handsome, accurate, and very easily operated, it is the modern register for today and tomorrow. It harmonizes with the finest bus interior.

The New INTERNATIONAL R13 Bus Register

FREE TRIAL OFFER

We will send the R13 Register on ten days free trial. Just send us your name and address.

The International Register Co.
17 South Throop St., Chicago

For Turnouts and Sidings



THIS new automatic switch stand speeds up schedules and reduces operating expense. Wherever the maintenance of one position of points is desired, as at the end of a double track, the operation of the Racor Three-in-One Switch Stand is of great advantage. It combines three distinct features in one compact housing.

(1) It is a *rigid switch stand* for free hand operation in either direction with all locking and safety features.

(2) It includes *automatic return* of switch points to original position after being trailed through from reverse direction.

(3) It incorporates *retarded return* of points under control of an oil cylinder dash pot which checks the return movement of points and prevents their slamming.

No other unit of trackwork equipment offers such opportunities for the acceleration of schedules and the reduction of operating costs as this Racor Three-in-One Switch Stand. Send for complete information.

RAMAPO AJAX CORPORATION
RACOR PACIFIC FROG AND SWITCH COMPANY, Los Angeles - Seattle
CANADIAN RAMAPO IRON WORKS, LIMITED, Niagara Falls, Ontario

General Offices – 230 PARK AVENUE, NEW YORK
SALES OFFICES AT WORKS, AND
McCORMICK BUILDING, CHICAGO
METROPOLITAN BANK BLDG, WASHINGTON
BUILDERS EXCHANGE BLDG, ST PAUL

Nine Racor Works
Hillburn, New York. Niagara Falls, N.Y. Chicago, Illinois. East St. Louis, Ill.
Superior, Wis. Pueblo, Col Los Angeles, Cal. Seattle, Wash Niagara Falls, Ont.

Behind Racor Service stand nine plants specializing in the manufacture and distribution of railroad track turnout and crossing equipment, including Manganese Work for heavy traffic.

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Ford, Bacon & Davis
Incorporated

Engineers

39 Broadway, New York
PHILADELPHIA CHICAGO
SAN FRANCISCO
NEW ORLEANS

ALLIED ENGINEERS, Inc.

Engineers and Constructors

120 Wall Street
New York

Transportation Examinations and Reports

THE BEELER ORGANIZATION
Engineers and Accountants
JOHN A. BEELER, DIRECTOR
Traffic — Traction
Bus-Equipment
Power-Management
Appraisals Operating and Financial Reports
Current issue LATE NEWS and FACTS free on request
52 Vanderbilt Avenue, New York

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ELECTRIC RAILWAY ENGINEER
WORCESTER, MASSACHUSETTS

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OPERATION-SERVICE

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UTILITIES

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CONSULTING ENGINEER
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OPERATING PROBLEMS—
TRAFFIC SURVEYS
VALUATIONS

HEMPHILL & WELLS
CONSULTING ENGINEERS
Gardner F. Wells
Albert W. Hemphill

APPRAISALS

INVESTIGATIONS COVERING
Reorganization Management
Operation Construction

50 East 42nd St., New York City

BYLLESBY ENGINEERING *and* MANAGEMENT CORPORATION

231 S. La Salle Street, Chicago
New York Pittsburgh San Francisco

SANDERSON & PORTER
ENGINEERS
for the
FINANCING—REORGANIZATION
—DESIGN—CONSTRUCTION
of
INDUSTRIALS and
PUBLIC UTILITIES

Chicago New York San Francisco

The P. Edward Wish Service

50 Church St., NEW YORK

Street Railway Inspection
DETECTIVES

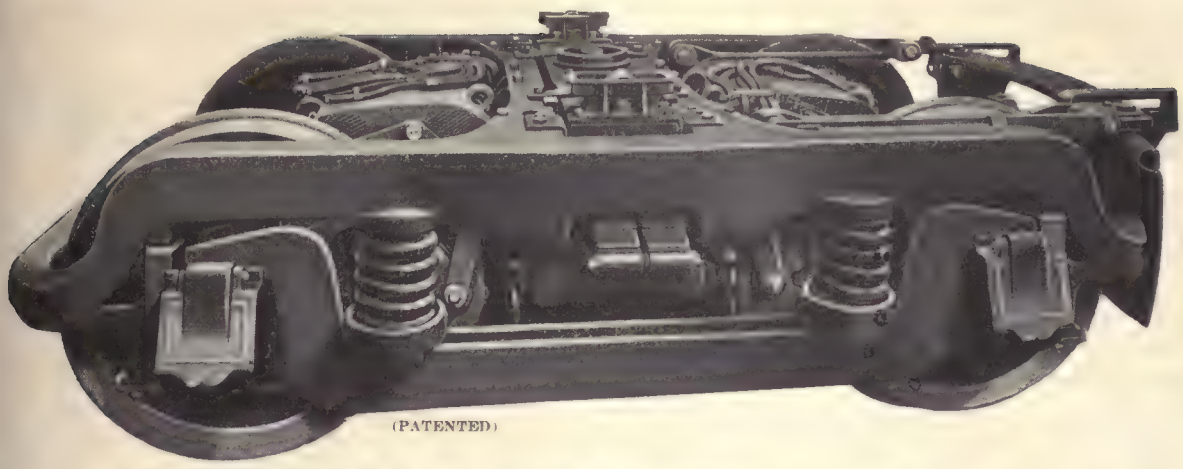
131 State St., BOSTON

WALTER JACKSON

Consultant on Fares
and Motor Buses

The Weekly and Sunday Pass
Differential Fares—Ride Selling

Suite 6-A
616 E. Lincoln Ave., Mt. Vernon, N. Y.


(PATENTED)

COMMONWEALTH TRUCKS

Their economical performance under all operating conditions has firmly established them with leading railways as standard. It stands the gaff of high-speed interurban service.

Cast steel frames, including cross and end transoms, a single strong unit.

Pedestals cast integral with frame. Removable hardened spring steel liners protect them from wear.

GENERAL STEEL CASTINGS CORPORATION

EDDYSTONE, PENNA. *GRANITE CITY, ILLINOIS*

N-L

Ventilators

Tail Lights

Track Sanders

Directo Door Signal

Universal Lanterns
(Safety and Signal)

Write for detailed Information.

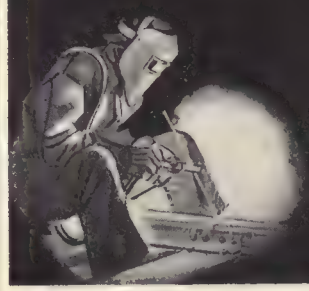
The Nichols-Lintern Co.
7960 Lorain Ave. Cleveland, Ohio



Roebling
Electrical
Wires & Cables

Quality Products

From the finest Magnet Wire to Largest Power Cables.



John A. Roebling's Sons Company, Trenton, N. J., Makers of Wire Rope and Wire

SEARCHLIGHT SECTION

EMPLOYMENT : BUSINESS : OPPORTUNITIES : EQUIPMENT—USED or SPECIAL

UNDISPLAYED—RATE PER WORD:

Positions Wanted, 5 cents a word, minimum $1.00 an insertion, payable in advance.

Positions Vacant and all other classifications, excepting Equipment, 10 cents a word, minimum charge $2.00.

Proposals, 40 cents a line an insertion.

INFORMATION:

Box Numbers in care of our New York, Chicago or San Francisco offices count 10 words additional in undisplayed ads.

Discount of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED—RATE PER INCH:

1 inch $6.00
2 to 3 inches ..... 5.75 an inch
4 to 7 inches ..... 5.50 an inch

Other spaces and contract rates on request.

An advertising inch is measured vertically on one column, 3 columns—30 inches—to a page. R.J.

COPY FOR NEW ADVERTISEMENTS ACCEPTED UNTIL 3 P. M. ON THE 20TH FOR THE ISSUE OUT THE FIRST OF THE FOLLOWING MONTH

POSITION VACANT

TROLLEY line foreman wanted for city railway having 30 miles overhead. State experience, salary expected and furnish references. P-228, Electric Railway Journal, Tenth Ave. at 36th St., New York.

POSITIONS WANTED

ARMATURE winder well experienced with railway equipment desires change. Reference. PW-217, Electric Railway Journal, 883 Mission St., San Francisco, Calif.

MASTER mechanic, now employed desires change. Good reference. Experienced interurban, city car and bus maintenance and overhauling. PW-227 Electric Railway Journal, 520 No. Michigan Ave., Chicago, Ill.

OPERATING manager, experienced in operating, equipment, financial and legal work in motor bus operation. Owned and operated Ohio system for past four years. Desirous of making permanent connection. References. PW-226, Electric Railway Journal, Guardian Bldg., Cleveland, Ohio.

SUPERINTENDENT transportation. Broad experience, fine successful record covering every phase of transportation. At present engaged. Wishes to make a change. Correspondence invited and treated confidential. Best of references. Can go anywhere. PW-225 Electric Railway Journal, Tenth Ave. at 36th St., New York.

INVESTIGATOR, 33 years old, wishes position with railway or bus company or any claim department; eleven years' experience as investigator for railroads and railways, including claim work, etc. PW-229, Electric Railway Journal, Tenth Ave. at 36th St., New York.

Over 6,000 other men in the field of Electric Railway transportation see this page!

That's why the advertisements bring such prompt results. For rates and other information address: SEARCHLIGHT DEPT. 10th Ave. at 36th St., N. Y. C.

FOR SALE
1000 K.W.
SYNCH. MOTOR GEN. SET
Modern type Westinghouse 575 v. D.C., 3 ph., 60 cy., 2,200 v., .8 P.F., A.C. 900 r.p.m. Motor Generator Set with Dir. Conn. Exciter and complete A.C. and D.C. Switchboards. Condition 95% New.
JOHN D. CRAWBUCK COMPANY
Empire Bldg., Pittsburgh, Pa.

Turn your idle machinery into CASH through a "Searchlight" advertisement.
G-1

Track Dismantling
We dismantle electric, steam and industrial railroad trackage with neatness and dispatch. Can save you money. Wire or write
A. DUIE PYLE CONTRACTING CO.
1223 Widener Bldg., Philadelphia, Pa.

INCREASE PROFITS—
By disposing of your idle equipment for CASH. Somewhere there is a BUYER for the equipment you no longer need—
ADVERTISE IT!
Wire, Write or 'Phone
Searchlight Department
Tenth Ave. at 36th St., N. Y.

FOR SALE
TURBO GENERATOR
Westinghouse, 1250 kva., 2300 volt, 3600 r.p.m., 2 phase, 60 cycle with turbine and condenser. LOCATION—Canton, Ill.
ENGINE GENERATORS
Westinghouse, 2300 volt, 3 phase, 60 cycle with Rice & Sargent and Chuse engines. LOCATION—Mattoon, Ill.
TURBO GENERATOR
General Electric, 2300 volt, 3 phase, 60 cycle with Terry turbine and Worthington condenser. LOCATION—Paris, Ill.
N. C. STIREWALT, *Purchasing Agent*
Central Illinois Public Service Company
Public Service Bldg., Springfield, Ill.

New and Relaying Rails
All Weights and Sections
We specialize in buying and dismantling entire railroads and street railways. Also industrial and public service properties which have ceased operation. We furnish expert appraisals on all such properties.
May We Serve You?
The Perry, Buxton, Doane Company
(Capital $1,000,000.00)
General Department, P. O. Box 5253, Boston, Mass.
Pacific Sales Office—Failing Building, Portland, Oregon

Your Best Market
for
Old Trolley Cars and Equipment
Reliable Service

L. SCHIAVONE & BONOMO BROS., Inc.
Jersey City New Jersey

ONE of our good advertisers, L. Schiavone & Bonomo Brothers, Inc., calls attention to the fact that we printed the following announcement on the page with their advertisement (as above) in a recent issue and suggests that the advertisements are not in harmony:

> **There is always a market for used railway equipment, somewhere. Don't make the mistake of junking it—advertise and turn it into CASH**

We accept the criticism and are glad to assure readers of the *Electric Railway Journal* that they make no mistake in junking equipment when it is not in condition to render good service to others.

Searchlight Department
Electric Railway Journal

The Use of Used Equipment—No. 1

STAND-BY SERVICE

A medium-sized industrial plant operating 24 hours per day was up against a periodical shutdown to repair a vacuum pump. While this pump was under repair production stopped.

The cost of a new pump, to act as a stand-by—that would be used probably 3 or 4 times per year—made the investment seem out of place and, as a pump was required that would pull a very high vacuum, no thought was given to the purchase of a used machine, until the superintendent of the plant suggested that he be permitted to see what could be obtained in a used pump.

The result was, that a first class rebuilt pump of the right size and pulling the required vacuum was purchased for less than $300, a big saving, and the stand-by unit was installed. **The price of the used pump was saved the first time the plant did *not* have to shut down to make repairs to the other pump!**

Possibly you have a similar condition in your plant. Then investigate GOOD USED EQUIPMENT. Check the equipment listed in these pages or write your requirements to the advertisers or to the Searchlight Department of this paper.

Good Used Equipment will solve many urgent temporary or permanent needs.



Scheduled Cleaning preserves surfaces and saves money

CLEANING cars and busses at the end of each day's run is an economical measure that helps preserve the painted surfaces and maintains their attractive appearance.

A growing number of railway and bus fleet superintendents have found that the Oakite way of doing this is both economical and effective. Road dirt, grease, and spots are removed *without injury to painted surfaces of wood or metal.* The emulsifying action of the Oakite solution breaks up the grime so that a cold water rinse leaves paintwork film-free and without signs of streaks. The original brilliancy of paintwork is preserved, and the intervals between repainting become noticeably longer.

Full information on economical Oakite materials and methods for this and other electric railway cleaning jobs is contained in our booklet, "Oakite for Railroads." If you operate a bus fleet you will also profit from our booklet, "Oakite for Garages, Service Stations and Repair Shops." Write for your copies. No obligation

Oakite Service Men, cleaning specialists, are located in the leading industrial centers of the U. S. and Canada

Manufactured only by
OAKITE PRODUCTS, INC., 28B Thames Street, NEW YORK, N. Y.

OAKITE
TRADE MARK REG U.S. PAT. OFF.
Industrial Cleaning Materials and Methods

ALPHABETICAL INDEX

This index is published as a convenience to the reader. Every care is taken to make it accurate, but *Electric Railway Journal* assumes no responsibility for errors or omissions.

Allied Engineers 80
Aluminum Co. of America ..... Insert 61-62
American Brake Shoe & Foundry Co 70
American Bridge Co. 73
American Car Co ..... Third Cover
American Steel & Wire Co 64
American Steel Foundries 68
American Tel. & Tel. Co 37

Beeler Organization 80
Bemis Car Truck Co 73
Bender Body Co., The 86
Bendix Westinghouse Automotive Air Brake Co 67
Bethlehem Steel Co. 36
Bibbins, J. Roland 80
Brill Co., The J. G. ..... Third Cover
Buchanan & Laying Corp. 80
Byllesby Eng. & Manag. Corp. 80

Carnegie Steel Co 59
Cities Service Co. 42-43
Collier, Inc., Barron G ..... Front Cover
Consolidated Car Heating Co 72

Dayton Mechanical Tie Co., The 34-35
Dodge Brothers ..... Insert 25-32

Electric Railway Improvement Co 76
Electric Service Supplies Co 10

Firestone Tire & Rubber Co., The 24
Ford, Bacon & Davis 80

General Electric Co. ..... Back Cover, 16-17-18
General Leather Co. 69
General Motors Truck Co. ..... Insert 49-52
General Steel Castings Co 81
Globe Ticket Co. 46
Goodrich Rubber Co., The B. F. 60
Goodyear Tire & Rubber Co 20-21

Hale-Kilburn Co. 12
Hemingray Glass Co. 74
Hemphill & Wells 80
Heywood-Wakefield Co. 23

Illinois Steel Co. 71
International Motor Co. 13
International Register Co., The 79

Jackson, Walter 80
Johns-Manville Corp. 53
Johnson Fare Box Co. 72

Kelker, Jr., R. F. 80
Kuhlman Car Co. ..... Third Cover

Long Mfg. Co. 48
Lorain Steel Co. 44

Mack Trucks, Inc. 13
McGraw-Hill Book Co., Inc 70
Mergott Co., The J. E. 77

Metal & Thermit Corp. 38-39
Mica Insulator Corp. 22
Money-Meters, Inc. 75

Nachod and U. S. Signal Co 78
National Bearing Metals Corp. 75
National Brake Co., Inc. 19
National Carbon Co. 57
National Paving Brick Co. 72
National Pneumatic Co. 15
National Tube Co. 55
Nichols-Lintern Co. 81

Oakite Products, Inc. 84
Ohio Brass Co. 8-9
Ohmer Fare Register Co. 45
Okonite Co., The 78
Okonite-Callender Cable Co., The 78

Pantasote Co., Inc., The 78

Rail Joint Co., The 77
Railway Track-work Co. 6-7
Railway Utility Co. 47
Ramapo Ajax Corp. 79
Richey, Albert 80
Roebling's Sons Co., John A. 81
Roller-Smith Co. 77

Safety Car Devices Co. 58
Sanderson & Porter 80
Searchlight Section 82-83
Standard Oil Co. (Indiana) 65
Standard Oil Co. of New York 54
Standard Steel Works Co. 66
Star Brass Works, The 85
Stoody Co. 11
Stucki Co., A. 76

Thomas Car Works, Perly 33
Timken-Detroit Axle Co. 40-41
Timken Roller Bearing Co. 56
Toledo Pressed Steel Co. 74
Tuco Products Corp. 79

Union Metal Mfg. Co., The 63
Union Switch & Signal Co. 74

Wason Mfg. Corp. ..... Third Cover
Westinghouse Elec. & Mfg. Co. ..... Second Cover, 4-5
Westinghouse Traction Brake Co. 14
Wharton, Jr. & Co., Inc., William 75
Wish Service, The P. Edw. 80

Yellow Coach ..... Insert 49-52

Searchlight Section — *Classified Advertising*

EQUIPMENT (Used, etc.)
Central Illinois Public Service Co. 82
Crawbuck Co., John D. 82
Duie Pyle Contr. Co., A. 82
Perry, Buxton, Doane Co., The 82
Schiavone, L. & Bonomo Bros., Inc. 83
Stirewalt, N. C. 82
POSITIONS VACANT AND WANTED 82

CHOSEN
for
PERFORMANCE

TROLLEY wheels are never chosen for looks, never selected because one kind costs a little more or less than another. They're chosen for performance. That's why

KALAMAZOO



trolley wheels and harps are the standard of comparison today. That's why many properties use them exclusively. There's a difference in trolley wheels. May we tell you about it?

THE STAR
BRASS WORKS
KALAMAZOO, MICHIGAN

This New BENDER Club Coach Has the Appeal . . . . . That Builds Charter Business . . .



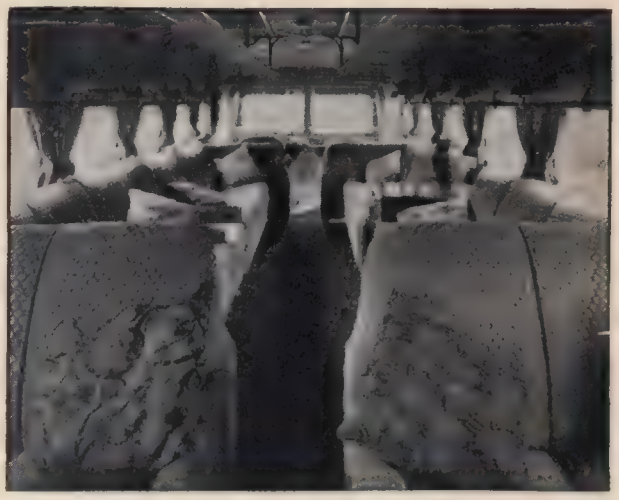
A chartered private car for trips anywhere to meet the requirements of the most discriminating people.



OUTSTANDING in beauty of line, color and finish . . . a touch of notable smartness in the beautifully grilled observation rear, the Bender Club Coach *creates passengers* . . . makes people *want to ride* in it in preference to driving their own private cars.

An interior with the elegance of a roomy, well-appointed drawing room . . . The divans and lounges provide the comfort never before experienced in any conveyance . . . Individually operated, parchment shaded, candlestick side-lighting . . . (in addition to regular dome lights) . . . give the interior any degree of light wanted.

Non-shattering glass all around affords protection. Special ventilating features built into tops of the window frames insure adequate ventilation without draft during inclement weather . . . Everything imaginable has been done for passenger comfort and safety including wide overhead luggage racks which facilitate accessibility to luggage and parcels.



For conventions, excursions, sight-seeing tours, special trips, extra fare operation and numerous other purposes, the Bender Club Coach is proving a big profit maker for operators.

THE BENDER BODY COMPANY
W. 62nd and Denison Cleveland, Ohio

B·E·N·D·E·R ··· B·O·D·I·E·S



The Trolley Bus of Today
has unusual public appeal—

The growing interest in trolley bus operation is the result of recent recognition of the merits of this type vehicle in public transportation. In Chicago, where the largest number of these rail-less electric carriers has been introduced, their popularity with the public is apparent. Comparatively noiseless in operation, quick yet smooth and comfortable in acceleration, clean and attractive in every way, and possessing ample power under every condition of road and load, the trolley bus has every characteristic to win patronage.

The J. G. BRILL COMPANY

HARRIS TRUST BUILDING CHICAGO · PHILADELPHIA · RIALTO BUILDING SAN FRANCISCO

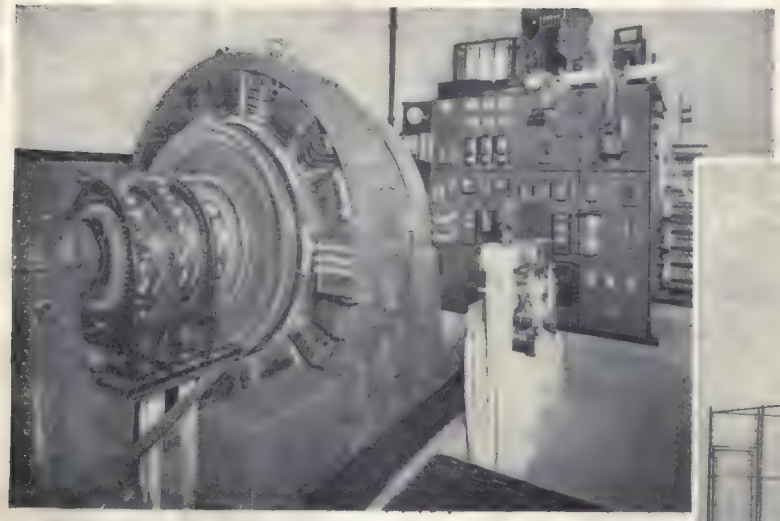
AMERICAN CAR CO., ST. LOUIS • THE G. C. KUHLMAN CAR CO., CLEVELAND • WASON MFG. CO., SPRINGFIELD, MASS.

8 of the last 15 purchased for Chicago were

BRILL TROLLEY BUSES

HOUSTON PUBLIC LIBRARY
HOUSTON
TEXAS

Modern Automatic Substations to Improve Service on the Northwestern Pacific —



Interior of automatic substation at Pine, Calif., equipped with G-E 1500-kw. synchronous converter

(Below) Exterior of Pine substation



THE electric division of the Northwestern Pacific Railroad serves a prosperous and fast-growing community in Marin County, California. From Sausalito, this interurban line extends through Mill Valley, San Anselmo, San Rafael, and other suburban communities, providing commuter service to link a vast residential area with San Francisco.

As a part of a comprehensive plan to improve service, two new substations were built, one at Pine, Calif., and one at Baltimore Park. These are G-E equipped and completely automatic. In addition, two 1000-kw. G-E synchronous converters with automatic control were installed at the San Anselmo substation.

Like many other G-E installations, this new equipment has resulted in a more reliable power supply and substantial operating economies. Ask your nearest G-E office for complete information.



Interior of automatic substation at Baltimore Park, Calif., showing 1000-kw. G-E synchronous motor-generator with automatic control



Automatic switching equipment, San Anselmo substation, controlling two 1000-kw. G-E synchronous converters

Join us in the General Electric program, broadcast every Saturday evening on a nation-wide N.B.C. network

130-27

GENERAL ELECTRIC

SALES AND ENGINEERING SERVICE IN PRINCIPAL CITIES

ELECTRIC RAILWAY JOURNAL

Graw-Hill Publishing Company, Inc. NOVEMBER, 1930 Thirty-five Cents per Copy

FARGO
BUILT BY CHRYSLER MOTORS



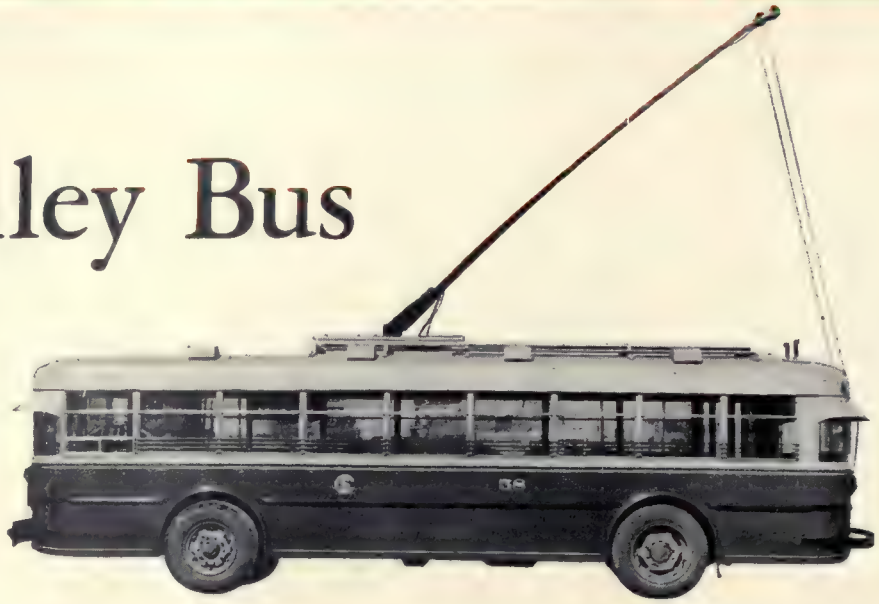
The operating economy of the 21-seat coach during the long off-peak periods and the total capacity of a larger coach during peak hours. Comparatively short wheelbase. Patronage-attracting—within and without. Passenger-circulating features that permit faster schedules. Built as a motor coach throughout. Original . . . practical . . . advanced.

SOLD DIRECT TO OPERATORS

FARGO MOTOR CORPORATION
DETROIT, MICHIGAN
A DIVISION OF CHRYSLER CORPORATION

WESTINGHOUSE—A PIONEER AND LEADER IN TROLLEY BUS APPLICATION

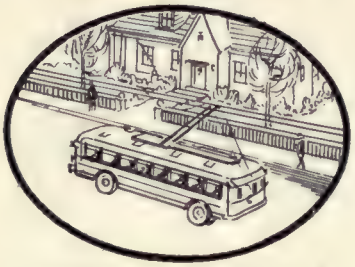
Where the Trolley Bus *serves*



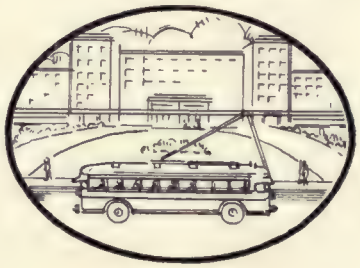
EVERY CITY has its boulevards where street car service is restricted, its hospital zones where quiet is required, and its congested thoroughfares.

The Trolley Bus with its overhead wires at the sides of the street and its ability to pass around parked cars, its quietness, easy riding and attractive appearance, as well as its speed and safety, should be a most acceptable solution.

Westinghouse furnishes complete electrical equipment for Trolley Buses including overhead and current collecting equipment.



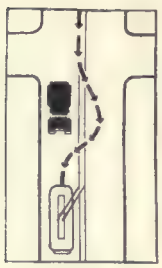
Restricted residential district



Quiet zone



Congested thoroughfares



Weaving in and out from the curb, dodging slow street traffic, the Trolley Bus proves its value in keeping fast, accurate schedules and satisfied patrons.

Service, prompt and efficient, by a coast-to-coast chain of well-equipped shops

Westinghouse

T 31462

TUNE IN THE WESTINGHOUSE SALUTE OVER THE N. B. C. NATION-WIDE NETWORK EVERY TUESDAY EVENING.

Electric Railway Journal

Consolidation of
Street Railway Journal and Electric Railway Review

JOHN A. MILLER, JR., Editor

Vol. 74, No. 12 — Pages 669-728

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Reviewing 1930

Facts and figures on all phases of electric railway operations for 1930 will appear in the annual Statistical and Progress Number of the JOURNAL for January, 1931. Developments in the field of rolling stock, track, motor buses, trolley buses and taxicabs (a new feature) will be presented in detail.

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1930

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Contents of This Issue

NOVEMBER, 1930

Copyright, 1930, by McGraw-Hill Publishing Company, Inc.

Editorials 669

Net Revenue Increased 400 Per Cent in Five Years Is Atlanta's Accomplishment 673

Snow Removal 676

A.I.E.E. Meeting Considers Railroad Electrification 682

Scheduled Speed Increased by Electrification 683

Regulation of Taxicabs as a Public Utility Recommended in New York 685

L.C.C. Tramways Get Low-Level Cars 687

Memorial to George Westinghouse 689

Co-ordinated Bus Operation Increases Revenues of Third Avenue Railway in New York City 690

Successful Trolley Bus Operation Demands Suitable Overhead 693
By G. W. BOWER

Pennsylvania Railroad Opens New Facilities in Philadelphia 696

Observations on Methods of Training Platform Men 698
By A VETERAN ELECTRIC RAILWAY OFFICIAL

New Maintenance Contest 701

New Carhouse Built at Detroit 702

Maintenance Notes:

Clamp for Installing Field Coils —*By R. Dumke* 704

Car Washing Machines Make Large Savings in Philadelphia 704

Grade Crossing Constructed for Heavy Vehicular Traffic 705

Lamp Cord Used for Controller Testing—*By J. Munford* 706

Simple Feeler Gages—*By Hoy Stevens* 706

Filling Sweeper Broom Blocks by Machine—*By Terance Scullin* 706

Copper and Mica Dust Collected on Commutator Slotter —*By H. J. Beadle* 707

Repairing Switches for Portable Crossovers—*By E. B. Spenzer* 707

Berlin Street Cars Washed by Machine 707

Seating Capacity of Cars Increased in Winnipeg 708

Gage Makes Wheel Mounting Easy—*By Terance Scullin* 708

Adjustable Hanger for Switch Contactors — *By H. A. Brown* 708

When Should Contact Line Be Renewed?—*By Angus Scott* 709

Motor Field Shunting Gives Old Cars New Pep—*By G. L. Moses* 710

New Products for the Railways' Use 711

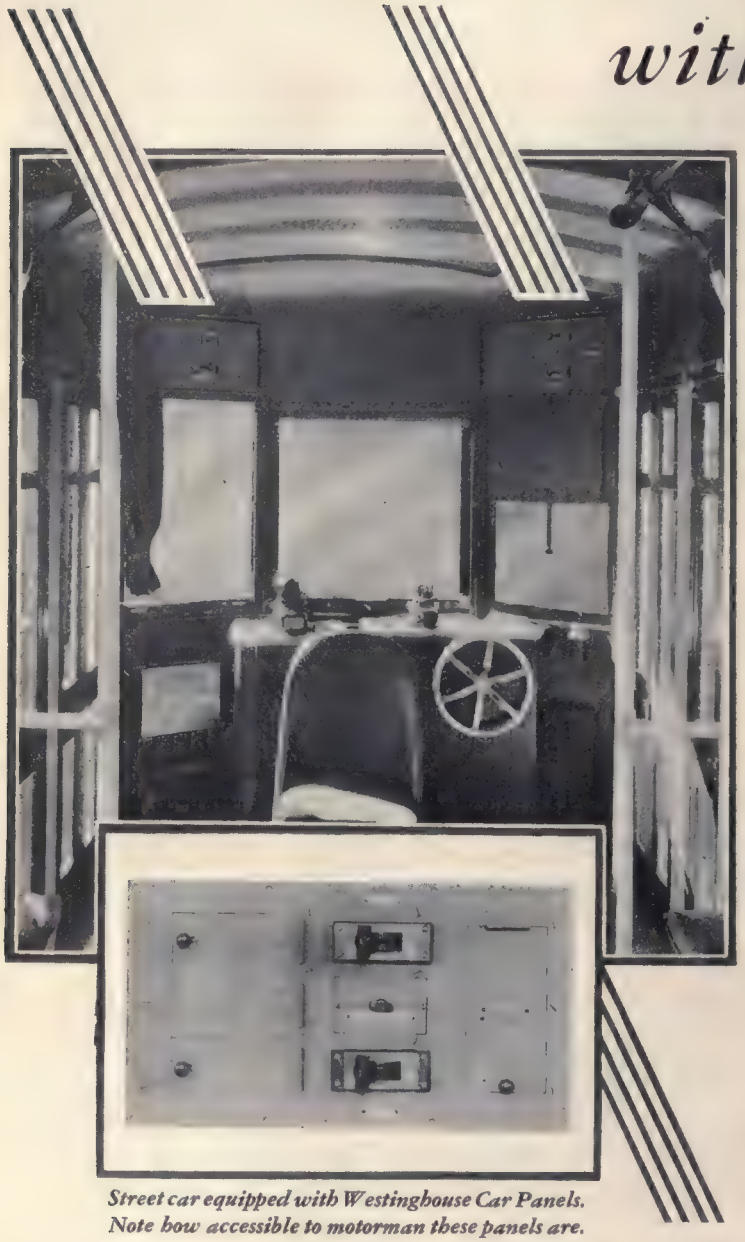
Monthly and Other Financial Reports 714

News of the Industry 715

EVERY CONTROL

within Easy Reach

with



Street car equipped with Westinghouse Car Panels. Note how accessible to motorman these panels are.

Westinghouse Car Panels

WITH the trend toward one-man operation of street cars, it is important that controls for lights, heaters and buzzer be placed within easy reach of the operator.

Westinghouse car panels can be grouped so that the motorman can operate all circuits without leaving his place at the controls. These panels, which are made of standard panelboard parts, can be assembled in various ways to meet the space and circuit requirements of each application. Unit section construction is used—permitting any section to be changed without disturbing the rest of the circuits. Interlocked door construction prevents unauthorized persons from reaching into the compartments and protects the operator at all times because no live parts are exposed.

When you order new cars or recondition your old ones, be sure that they are equipped with Westinghouse safety car panels.

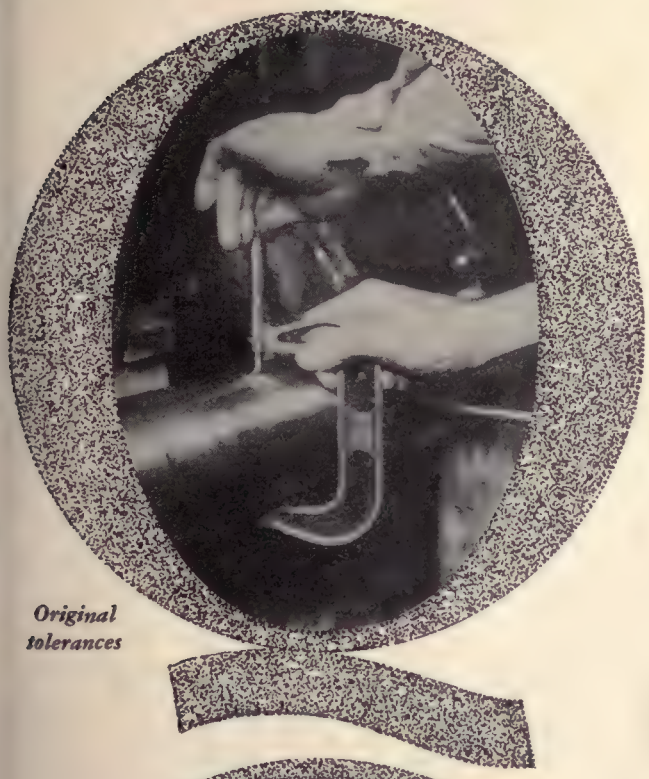
Service, prompt and efficient, by a coast-to-coast chain of well-equipped shops

Westinghouse

T 31531

TUNE IN THE WESTINGHOUSE SALUTE OVER N. B. C. NATION-WIDE NETWORK EVERY TUESDAY EVENING

RENEWAL PARTS



Original tolerances



Original dimensions

from the original designs *reduce maintenance*

LONG life and efficient operation of equipment demand the highest grade of renewal parts. Economical maintenance requires the same dimensions, machine tolerances and characteristics of renewal parts as for the original parts furnished with the equipment.

Westinghouse renewals are manufactured from the same drawings, specifications and tools as were used in first building the equipment, thus insuring an exact duplication in all respects.

To secure the best results from your Westinghouse equipment, use only Westinghouse renewal parts.

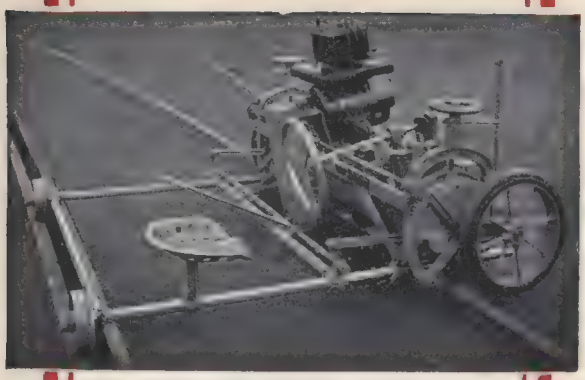
QUANTITY *production* makes QUALITY *practical*

Service, prompt and efficient, by a coast-to-coast chain of well-equipped shops

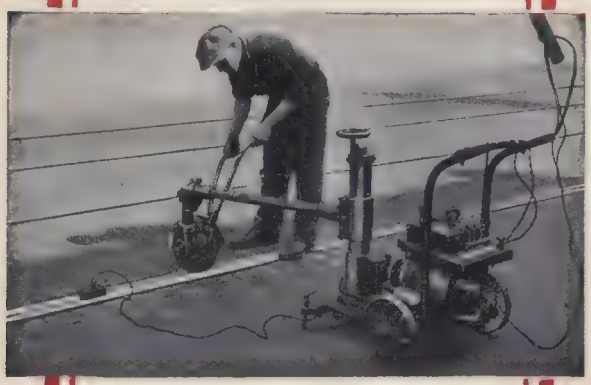
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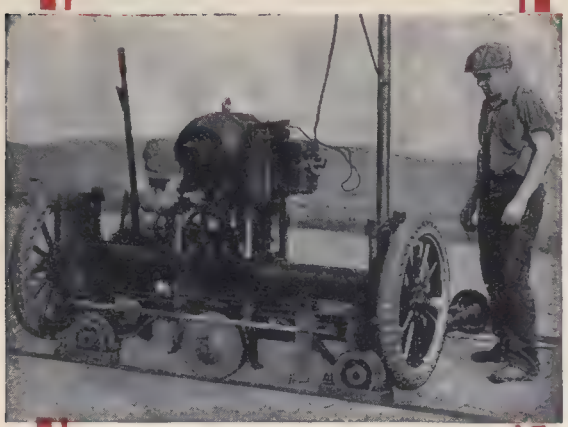
TUNE IN THE WESTINGHOUSE SALUTE OVER THE N. B. C. NATION-WIDE NETWORK EVERY TUESDAY EVENING.



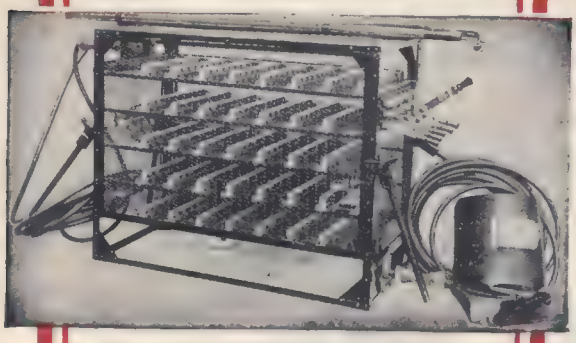
Improved Atlas Rail Grinder



Eureka Radial Rail Grinder



Imperial Track Grinder



Ajax Electric Arc Welder

Incompatibles: low rail joints and low car maintenance

Good cars don't stay good long on rough track. On good track, even old cars cost less to run and maintain.

New or old, cars don't build good-will or traffic if you give your passengers a rough ride.

In the mind of to-day's public a rough ride is a rough deal.

Smooth the rail and you smooth the public temper.

Build up low joints and you build up traffic.

Eradicate corrugations and you eliminate a source of complaint.

These jobs, like life itself, are largely a constant grind. Here are the grinders—plus their able assistant, the electric arc welder.

Railway Trackwork Co.

3132-48 East Thompson Street, Philadelphia

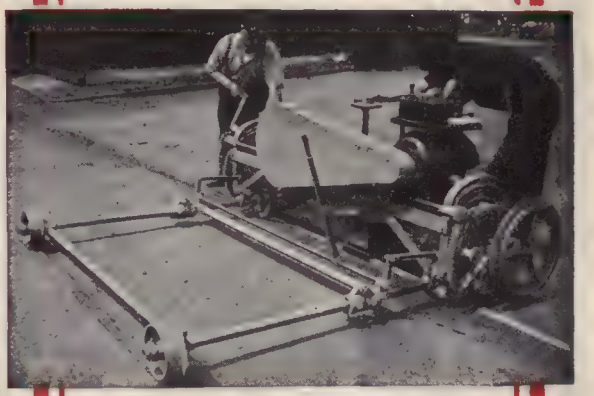
AGENTS

Chester F. Gailor, 50 Church St., New York
Chas. N. Wood Co., Boston
H. F. McDermott, 208 S. LaSalle St., Chicago
F. F. Bodler, San Francisco, Cal.
H. E. Burns Co., Pittsburgh, Pa.
Equipment & Engineering Co., London

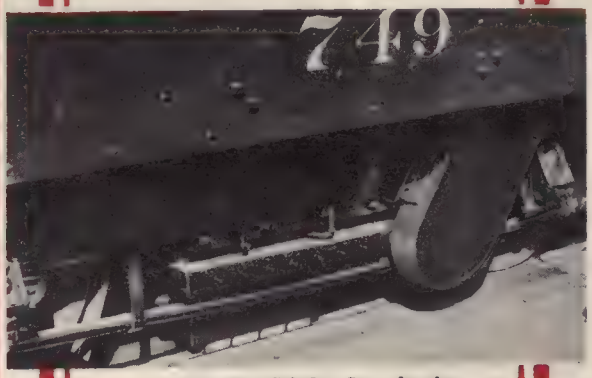
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Reciprocating Track Grinder



Vulcan Rail Grinder

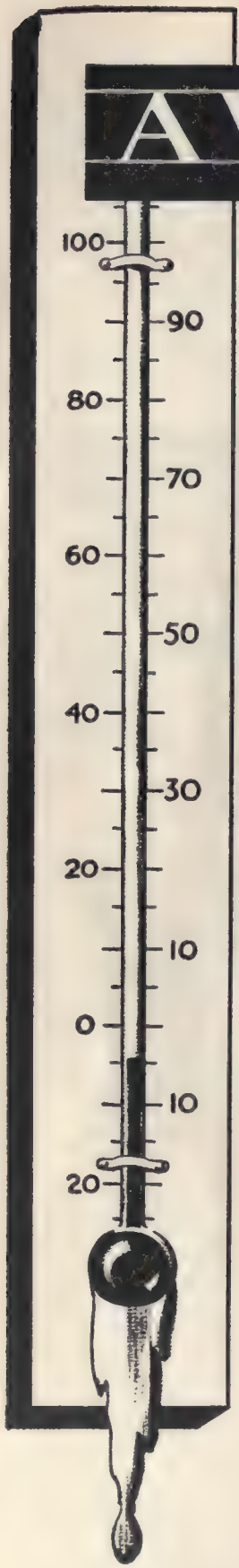


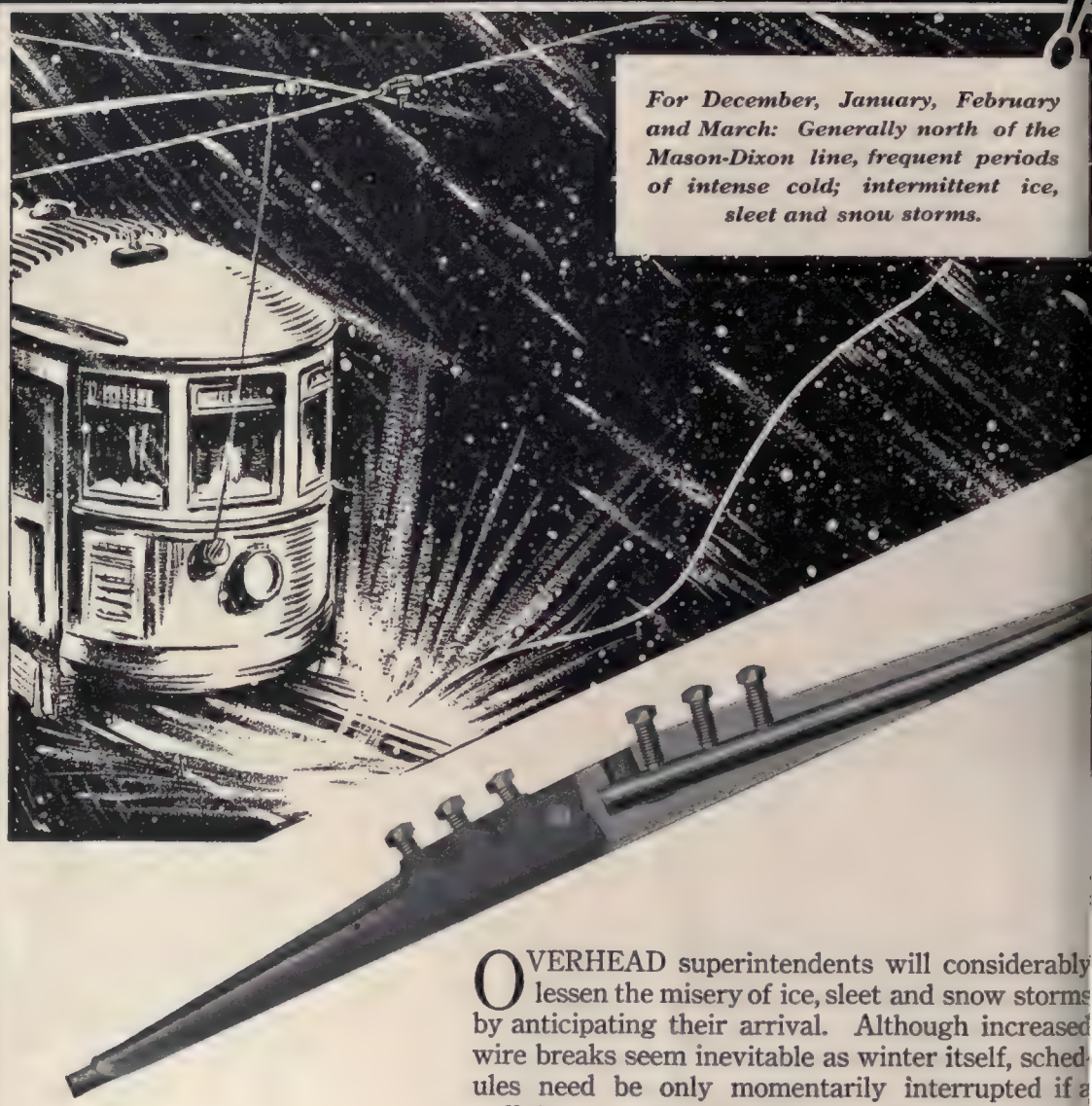
Reciprocating Grinder Car, showing one of the grinding units.



RTW Curve Oiler

A WEATHER FORECAST!





For December, January, February and March: Generally north of the Mason-Dixon line, frequent periods of intense cold; intermittent ice, sleet and snow storms.

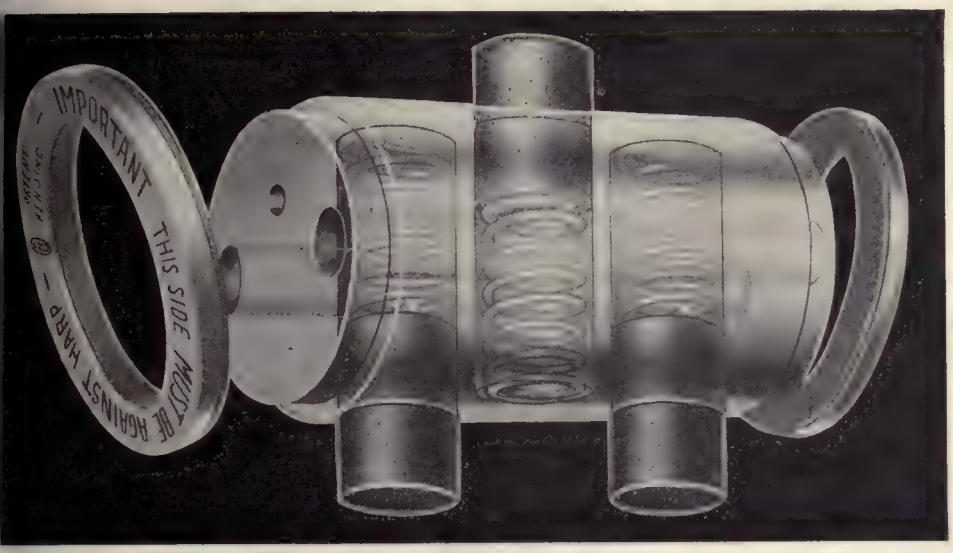
OVERHEAD superintendents will considerably lessen the misery of ice, sleet and snow storms by anticipating their arrival. Although increased wire breaks seem inevitable as winter itself, schedules need be only momentarily interrupted if a sufficient supply of O-B Splicers is maintained.

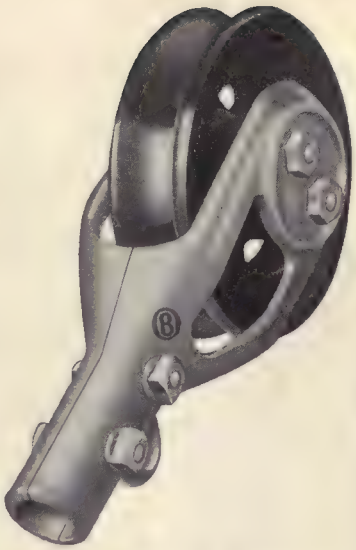
O-B Splicers are as lasting as trolley wire. They are made with a low center of gravity to insure upright position; a smooth approach and leave that minimizes wear on trolley wheels; and their construction, which makes wire forming unnecessary, makes splicing a rapid-fire operation.

Full particulars of the popular Type C Splicers, as well as other O-B designs, may be found on pages 541 to 549 of O-B Catalog No. 20.



YOU CAN THROW AWAY YOUR OIL-CAN AND INCREASE WHEEL MILEAGE





O-B TROLLEY Wheels are continuously and amply lubricated by three graphite plugs in the one-and-one-half inch steel axles and by two copper-graphite composition washers at the ends of the hubs. Not only do the washers provide abundant lubrication for the wheels, but they are also excellent conductors and provide a path directly from wheel to harp. Thus, any tendency toward pitting of the axle and the inside of the wheel hub has been eliminated.

The newly-designed harp protects the wheel from injury by span wires.

EVEN if the only advantage of the O-B Trolley Wheel lay in the self-lubricating features, it would still be a marked improvement in current collection equipment. For the O-B Trolley Wheel makes it no longer necessary to send a daily "expeditionary force" to car roofs to perform a costly, time-consuming and messy job of oiling trolley wheels.

But consider these additional advantages: *increased mileage*—often doubling, and not infrequently tripling, the mileage which experience has led one to expect from trolley wheels: *better current collection*—the O-B Trolley Wheel provides a path mainly from the wheel through copper-graphite washers to the harp: *decreased maintenance*—not only is oiling eliminated, but a noticeable decrease in parts wear is experienced.

The fact that scores of important properties have standardized on O-B Trolley Wheels furnishes convincing proof of their increased profit-ability. One trial generally demonstrates their excellence. Full information is given on page 106 of New Products Supplement No. 4 to O-B Catalog No. 20.



NEW PRODUCTS *Supplement No. 4.*

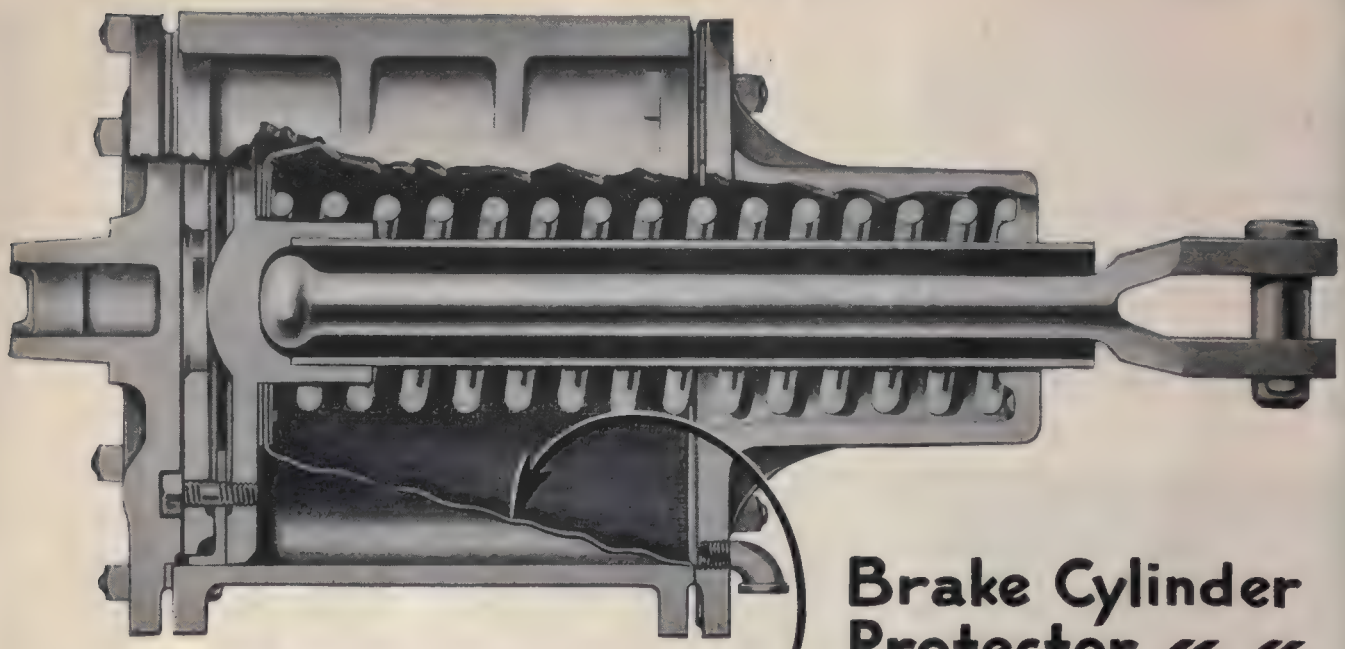
O-B Trolley Wheels and twenty-five other new or improved products are listed for the first time in this New Supplement No. 4. If you failed to get your copy, write promptly for one.

Ohio Brass Company, Mansfield, Ohio
Canadian Ohio Brass Co. Limited
Niagara Falls, Canada
1319CL

Ohio Brass Co.

NEW YORK PITTSBURGH CHICAGO CLEVELAND ST. LOUIS ATLANTA DALLAS
PHILADELPHIA BOSTON LOS ANGELES SAN FRANCISCO SEATTLE

PORCELAIN INSULATORS
LINE MATERIALS
RAIL BONDS
CAR EQUIPMENT
MINING MATERIALS
VALVES



Brake Cylinder Protector « «



A TRAP for Destructive DIRT « «

THIS protector—a collapsible water-proof hood—when inserted in the brake cylinder as shown, traps dirt and moisture that may enter at the non-pressure head, and prevents them from reaching the cylinder walls » » The advantages of this protection are that the lubricant is preserved, leakage reduced, life of packing cup lengthened, and maintenance expense lessened » » *Are your brake cylinders thus protected?*

WESTINGHOUSE TRACTION BRAKE CO.

General Office and Works

WILMERDING PENNSYLVANIA



THREE OUT OF FIVE WINNERS OPERATE TWIN COACHES

WINNERS

Class A

✓ United Electric Railway Company

✓ Community Traction Company

Class B

Blue Transportation Company

Washington Rapid Transit Company

Class C

✓ Groton and Stonington Traction Compan

✓ DENOTES OPERATORS OF TWIN COACHES

THE combined Twin Coaches operated by these winning companies total over 100 units. • All of which is convincing proof of the importance of Twin ownership in the advancement of American motor coach operation. • Remember, these awards were made for decreased maintenance costs and increased earnings.

Twin Coach

BY E.R. FAGEOL KENT, OHIO

LIGHT, HEAT AND VENTILATION FOR BUSES

New KEYSTONE-IVANHOE BUS-LIGHTING FIXTURES

Designed to combine efficient illumination and a suggestion of refined luxury, this new series of Bus-Lighting Fixtures is now available to manufacturers and operators.

The metal work is attractively designed in a variety of finishes. Glassware is special, non-reflecting opal glass, with correct diffusion properties.

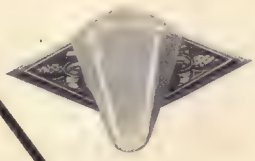


Left:—For center ceiling mounting. Designed for 21 candle power lamp. Equipped with double contact removable sockets.

Lower Left:—For over-window mounting. Can be had with or without individual toggle switches. Also designed for 21 candle power lamps and are equipped with double contact removable sockets.

Below:—For side panel mounting between windows. Unusually attractive and efficient. 21 candle power lamps. Double-contact removable sockets.

Ask for data sheets showing these and other types





The MUELLER-EVANS HEATING AND VENTILATING SYSTEM FOR BUSES . . .



This simple system has no moving parts, no heating elements, no maintenance. Yet it furnishes heat and ventilation on a par with present office-building standards. Completely eliminates gas fumes and foul air from the bus body. Is inexpensive, easily installed and will deliver required degree of heat in zero weather. Write for specifications, description and prices.

ELECTRIC SERVICE SUPPLIES CO. Manufacturer

RAILWAY, POWER AND INDUSTRIAL ELECTRICAL MATERIAL

Home office and plant at 17th & Cambria Sts., PHILADELPHIA; District office at 111 N. Canal St., CHICAGO; 50 Church St., NEW YORK; Bessemer Bldg., Pittsburgh; 88 Broad St., Boston; General Motors Bldg., Detroit; 316 N. Washington Ave., Scranton; Canadian Agents, Lyman Tube & Supply Company, Ltd., Montreal, Toronto, Vancouver, Winnipeg.

WRITE FOR DESCRIPTIVE BOOKLET No. 291



Your welders need not be experts when Stoody Manganese Welding Rod is used—the quality of the deposited metal is assured by the chemical analysis of the rod itself rather than by any intricate method of application. Stoody Manganese Welding Rod has made it possible to cut railway maintenance costs in half and lower maintenance costs automatically result in more net revenue for your company.

STOODY COMPANY

Manufacturers of

Welding Rod ◆ Alloy Steels ◆ Equipment

WHITTIER, CALIFORNIA





"Comforts" are tricky things. A street railway can spend millions for new cars with all the modern conveniences and facilities that make riding easier. Safety appliances, lower steps, sanitary straps and handholds, better ventilation, improved heating, quieter gears, cleaner equipment—all of these essential improvements contribute to traveling comfort and it is unfortunate that passengers pay so little attention to them.

But, even when installed in existing cars, the luxury of modern Hale & Kilburn seating arouses popular enthusiasm. Literally, it makes passengers

SIT DOWN AND TAKE NOTICE

HALE & KILBURN SEATS

HALE & KILBURN CO.

General Offices and Works: 1800 Lehigh Ave., Philadelphia

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Hale & Kilburn Co., Graybar Bldg., New York
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H. M. Euler, 53 First St., Portland, Oregon

For low cost per mile
For trouble-free service
For Safety



It is significant that Bethlehem Wrought Steel Wheels are so widely used on electric railways. Significant, because there is no more severe service demanded of wheels than that resulting from today's higher speeds, and the quicker starting and stopping of modern cars. Only wheels of high character can stand up under the extremely heavy traffic of our cities and their suburbs.

Bethlehem Wrought Steel Wheels have strength, endurance and wearing qualities worked into them during the process of manufacture. Five distinct forging and rolling operations are required to make a Bethlehem Wheel. The forging gives the metal density and toughness. The rolling establishes a refinement of grain structure, with a corresponding increase in strength and ductility. Each wheel is carefully inspected at every step, throughout the process of manufacture.

If you investigate these wheels you will learn, as so many other electric railway executives have learned: that for trouble-free service, for safety, for low cost-per-mile, Bethlehem Wrought Steel Wheels are unsurpassed.

BETHLEHEM STEEL COMPANY, General Offices: BETHLEHEM, PA.

District Offices: New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Buffalo, Pittsburgh, Cleveland, Cincinnati, Detroit, Chicago, St. Louis.

Pacific Coast Distributor: Pacific Coast Steel Corporation, San Francisco, Los Angeles, Seattle, Portland, Honolulu.

Export Distributor: Bethlehem Steel Export Corporation, 25 Broadway, New York City.

BETHLEHEM
Wrought Steel Wheels



To the bowl . . .

The N.P. Automatic Treadle Operated Exit Door is the quickest, as well as . . . . . .

"The Easiest Way Out"

NP

NATIONAL · PNEUMATIC · COMPANY

G-E QUALITY - - -
in the Original Equipment
MAKES THESE RECORDS POSSIBLE

THE high quality of General Electric railway motors, together with carefully supervised maintenance methods, results in the most economical operation. And progressive operators everywhere know that the highest possible standard of maintenance is obtained only by using renewal parts of original-equipment quality.

AT HAMILTON, OHIO



The Hamilton City Line of the Cincinnati and Lake Erie Railroad Company operates 16 light-weight, single-truck cars equipped with two GE-264 motors. These motors, in service for eight years, have operated a total of 5,760,000 car-miles with only two armature failures, or a total of 2,880,000 car-miles per armature failure.

AT LEXINGTON, KY.

The Kentucky Traction and Terminal Company has operated 62 GE-264 motors in interurban service for a period of eight years. Only ten of the armatures have been rewound, and the average mileage before the first rewind was 327,800. The armatures not yet rewound have averaged 405,482 miles.



AT DAYTON, OHIO

The Dayton Street Railway Company operates 15 light-weight, single-truck cars equipped with two GE-264 motors. It is estimated that these cars are being accelerated at rates from 2.0 to 2.5 mphps. However, during eight years of operation, it has been necessary to rewind only eight of a total of thirty armatures, and four of these failures were caused by running through flooded streets.

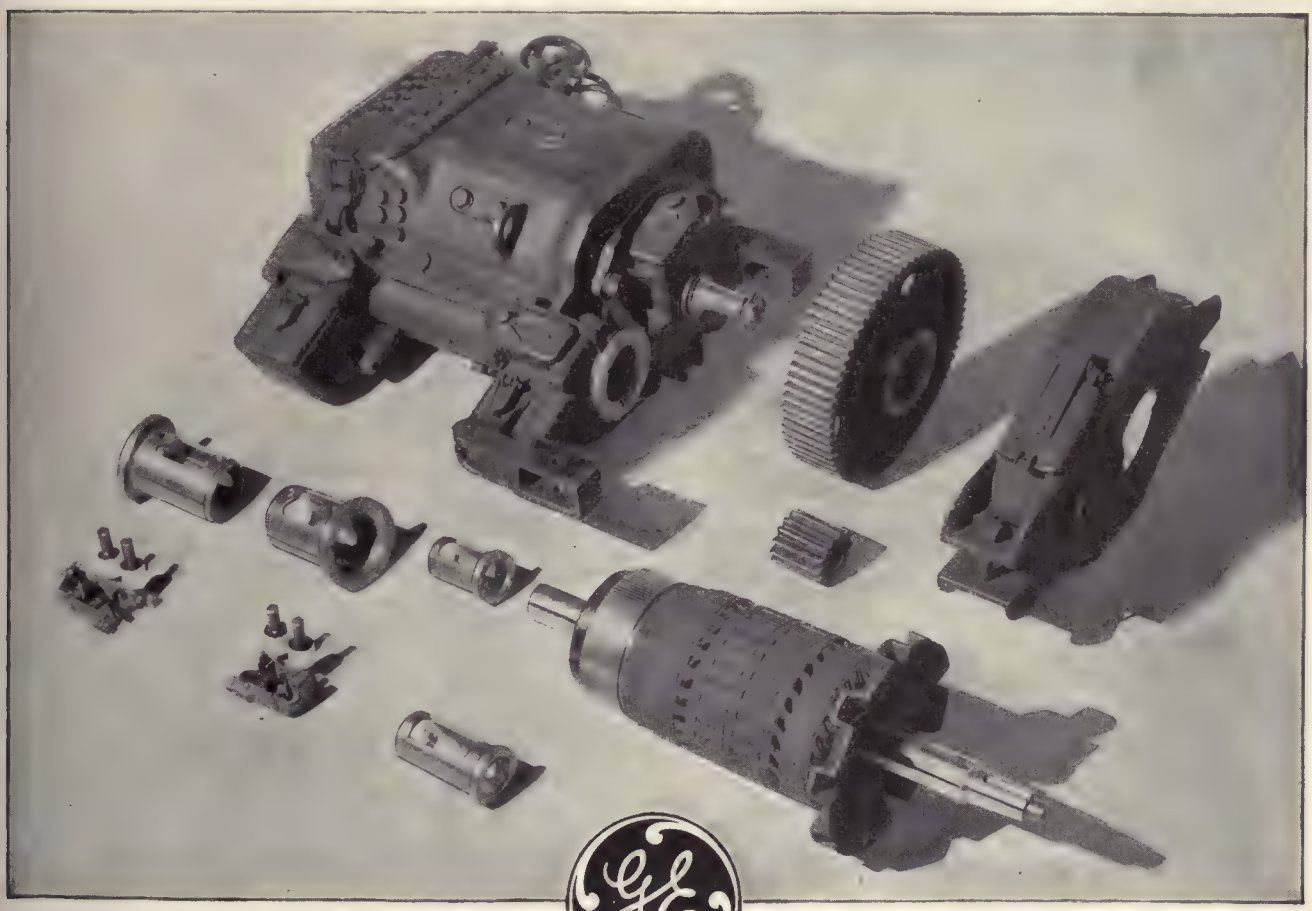
AT HIGHWOOD, ILL.

The Chicago, North Shore and Milwaukee Railroad Company recently replaced a number of cars which had been in service more than twenty years. Among the GE-73 motors replaced was one which had operated a total of approximately 1,500,000 car-miles without rewinding.

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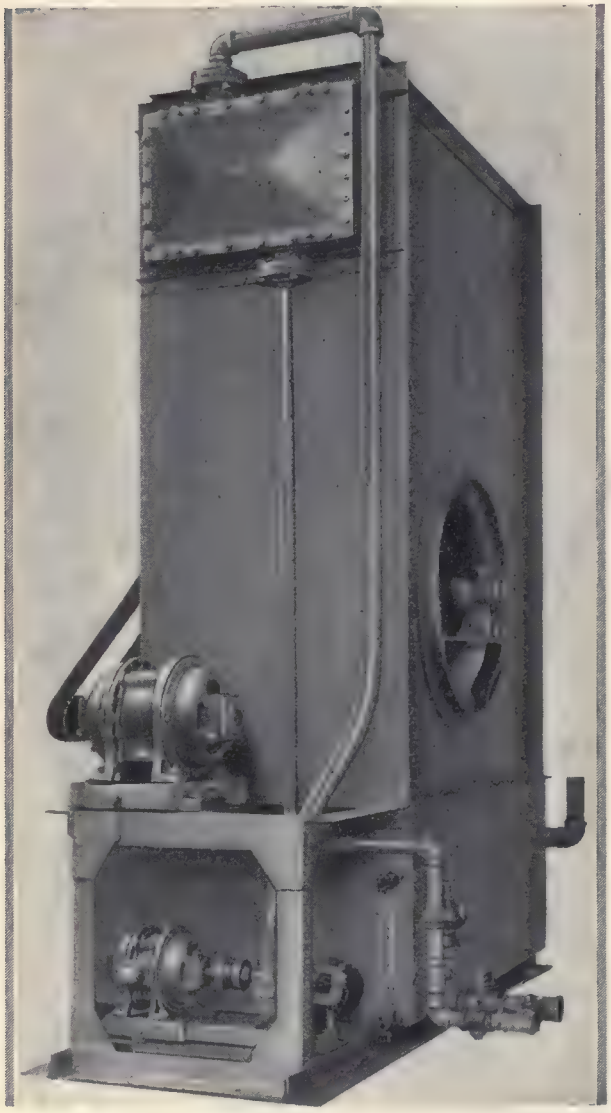
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GENERAL ELECTRIC

SALES AND ENGINEERING SERVICE IN PRINCIPAL CITIES

Electric Railway Journal

Consolidation of
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JOHN A. MILLER, JR., *Editor*

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Urban Transportation Facilities Keep Pace with Population Increase

EXPANSION of organized public transportation facilities in American cities has continued steadily during the past decade, despite the enormous increase in the use of private automobiles. According to the recently completed United States census of 1930, nearly half of the inhabitants of this country live in 189 cities of more than 50,000 population and in the suburban territory immediately adjacent thereto. Today the combined rail, bus and trolley bus facilities available in these communities are approximately 20 per cent greater than those available a decade ago, while the increase in population has been about 24 per cent. From this it is evident that transportation service has kept pace with the growth of population.

In all but one of these cities of more than 50,000 population the electric railway is the backbone of the local transportation system. Even in the single city where rail service has been suspended, there is lively agitation for its restoration. To serve this immense urban territory the electric railways operate approximately 60,000 passenger cars on slightly more than 23,000 miles of track. This equipment represents 80 per cent of all the electric railway passenger cars in the country, while the track is about 60 per cent of the total electrified mileage, not counting electrified steam railroads. During the past ten years the change in total track mileage has been less than 1 per cent, abandonments in some localities having been almost exactly balanced by extensions in others. Similarly, there has been no substantial change in the number of passenger cars operated on these properties, old rolling stock having been retired to offset the new cars acquired.

TO SUPPLEMENT their rail service the electric railways operate approximately 9,000 motor buses over some 7,000 miles of route in 167 of these cities. This is slightly more than 75 per cent of the total number of buses operated by electric railways in the United States, but the route mileage is only 30 per cent of the total. There is also a small amount of urban bus operation independent of the railways, but this is not an important factor in the transportation situation except in a few cities. Practically all of the present bus route mileage has been added since 1920, there having been less than 100 miles of bus route operated by these electric railways at that date with only a few vehicles.

Recent extensions of trolley bus operation bring the present total length of route to approximately 60 miles and the number of vehicles to about 200. All of the existing trolley bus operations have been undertaken during the past decade, a few earlier installations having been abandoned prior to 1920. While the present extent of this type of operation is comparatively small, there are many indications that the next ten years will see a substantial expansion.

In about a dozen cities the electric railways operate taxicabs as well as rail and bus service. According to the latest available figures approximately 2,500 taxicabs are operated under electric railway auspices out of a total of some 65,000 in this group of 189 cities. While the desirability of co-ordinating the taxicab with other forms of public transportation has long been evident, the lack of adequate regulation has tended to deter the established transportation companies from entering this field. Recently there has been a growing tendency to classify taxicab service as a public utility. When this is done it is likely that the electric railways will expand their activities in this field.

PUBLIC transportation facilities in the smaller cities ranging from 10,000 to 50,000 in population have developed more slowly than in the large cities. The census of 1930 shows 789 cities in this smaller group. Of this number 531 have electric railway service. Among those which do not have rail service a considerable number have bus service. In many instances this is furnished by the same company which formerly operated street cars, while in others the bus operation is under independent auspices. Only about 60 cities have no organized transportation facilities of any kind.

Every reason exists to expect that public transportation facilities in cities of more than 50,000 population will continue to expand during the next ten years. A substantial expansion occurred between 1920 and 1930 despite an increase of nearly 200 per cent in the number of private automobiles. The rate of increase in private transportation facilities, however, is dropping. The fact that the ratio of automobiles to population in the large cities is only about half that in the small cities indicates that congestion is tending to discourage the use of individual vehicles. This is borne out by a recent count in one large city, which showed fewer automobiles entering the business district than were reported five years ago. On the other hand, people have a steadily increasing tendency to go from place to place. This can have only one result: a steadily growing demand for public transportation facilities.

Solving the Problem for Small-City Systems

IN SMALL cities the problem of making the public transportation service self-supporting continues to present serious difficulties. Nowhere has any simple and easy solution been found. But progress has been made in some places as a result of thorough analysis of conditions and carefully organized effort to increase riding.

Many factors affect the success of a small-city transportation property. The business and industrial situation, the provisions of the franchise, the financial structure of the company, the condition of the physical plant and equipment, the morale of the operating organization—these and numerous other things have an important influence.

Thorough understanding of local conditions is essential. This should include the opinions of the company's patrons as well as the opinions of those who do not use the service. Competition from other agencies, location of business centers, changing trends in population, industrial activity, and many other similar factors, must be taken into account.

Among the problems most deserving of study is that of financial structure. Lack of flexibility is frequently a deterrent to progress. In some instances it may be found that securities have outlived the property they represent, or the earnings are too low to justify new capital with a proper return on the old. Drastic readjustment in the financial structure may be necessary to place the system on a sound basis—to assure a fair return on the investment and to enable the attraction of new capital for improvement programs.

Analysis of operating costs will sometimes point the way to substantial savings. This will show whether headways are suited to the traffic demands, whether speed is at a maximum, and whether economies may be instituted without harmful results. Although expenses must of necessity be adjusted to the level of earnings, there is often grave danger in going too far in effecting economies. High-grade service is absolutely necessary if a railway is to build up its business, and this should not be hampered by unwise economy measures.

Another factor which demands careful consideration is the equipment. Three distinct types are now available —the street car, the trolley bus and the gasoline bus. Each has a different field of usefulness. If an analysis shows one type of vehicle to be better suited for meeting the requirements than another, the management should not hesitate to make the change as quickly as it is possible to do so. In this respect, the operator must take the attitude that he is primarily a transportation man and not simply a street car or bus operator.

Having analyzed the operating conditions in detail, the small-city manager might well concentrate on a definite program of merchandising. Fundamentally, merchandising involves three distinct steps—the production of a salable product, pricing this product so that it will appeal to the purchaser, and the actual selling. In the matter of pricing, comparatively little experimentation has been done. The old-fashioned flat fare still prevails in most cities. Undoubtedly a real opportunity exists to make improvements in this respect.

Actual selling of the service requires the whole-hearted and active co-operation of every member of the railway organization. Although the men on the cars have the best opportunity to promote business, all of the others play important parts. Market analyses; soliciting patronage by house to house campaigns; offering special inducements; notifying the public of service, equipment or fare changes; bettering the public relations at every opportunity and supplementing these efforts with skillful, well-planned advertising, are among the many steps that can be taken in an intensive merchandising campaign.

Prompt action is needed in attacking the small-city problem. Delays only add to the difficulties. Haphazard efforts in attempting to find a solution only lead to further complications. Obviously, the first step is a thorough analysis of the situation on each individual property.

Taxicabs as a Public Utility

OF PRIME importance to all local transportation interests are the recommendations presented in the comprehensive report of the Mayor's commission on taxicabs for the city of New York. Briefly, it is proposed that the business be established as a public utility under a bureau of taxicab control, that certificates of convenience and necessity be required and that taxicabs be operated under a single franchise in co-ordination with other transit agencies. Directly affecting about 20,000 cabs, a substantial proportion of the total number in the United States, these recommendations are likely to have a far-reaching influence on the entire industry.

It has long been contended that the unhealthy condition of the taxicab industry could best be cured by placing it in the category of a common carrier. This has already been done on a state-wide basis in Arizona, Connecticut, Maryland, Oklahoma, Pennsylvania and Rhode Island and in about a dozen cities in other states. That it should be done in the city of New York is the opinion of the commission.

Granting certificates of convenience and necessity will have two important results. It will limit the number of cabs in use, thereby permitting them to operate more efficiently and more profitably, and it will also raise the standards of service by imposing strict requirements on the drivers. Experience in the states and cities where this arrangement is in effect has demonstrated its advantages.

Regulation of taxicabs as a public utility and the issuance of certificates are intended, according to the New York report, to serve as stepping stones to the ultimate granting of a single franchise for the entire city. This proposal has naturally evoked protest from individual operators, small-fleet owners and interests dependent on these groups. Whether or not it would be advisable to have a complete monopoly of taxicabs in New York City is a matter of opinion. It has been found in several other cities, however, that taxicabs can be operated to the best advantage by large companies. With the pressing need for co-ordination of all transit facilities, the monopoly plan for taxicabs probably will grow in favor.

Other recommendations contained in the New York report include reduction in the number of cabs, uniform rates and service standards, uniform accounting and reporting, establishment of a city-wide plan of taxicab stands, improvement of labor conditions and establishment of qualifications for drivers. Regulation to carry out these recommendations cannot be enacted until certain legal questions have been settled. Even when this has been done, the process of changing over to a public

utility basis may be slow. It is indisputable, however, that the adoption of these recommendations would be a long step toward placing the taxicab business on a sound economic basis and would at the same time assure the public of an improved quality of service.

Compound Ignorance

NOWADAYS when some difficult problem has to be solved it is customary to begin by making a "survey" of the situation. That is generally considered to be a scientific way of securing data on which to base a decision. Sometimes it is, but very often it is not, because the method of collecting the desired information is not calculated to produce accurate results. Too many so-called "surveys" are based almost entirely upon guesswork. For example, numerous parking "surveys" have been based on estimates of merchants as to the volume of business brought to their stores by private automobiles. Their guesses, collected and tabulated, were embodied in a report. This had the appearance of containing information scientifically obtained, but was in reality little more than what has been appropriately called compound ignorance. A survey whereby facts are definitely ascertained is the best possible basis for reaching a decision on a vexing problem, but surveys based on guesswork are valueless.

$9,000,000 Choice for Indianapolis

MONTHS must elapse before the reorganization of the Indianapolis Street Railway is completed, but the preliminaries have been carried out with celerity. The receivership dates back only to April 18 of this year. Yet since then a plan has been evolved which, if it is concluded, will witness the expenditure of more than $9,000,000 over a period of five years. This is a large program. The amount of new money is a sizable sum. Aside from the technical terms of the reorganization, drastic in some respects, interest centers for the time on conditions upon which the new money is to be supplied.

Reasonable protection against any possible recurrence of the events which led up to the present receivership is what the new interests seek. They know that economic forces are at work in which all business must find its level, and they also know that in the past artificial barriers have been raised which militated against the success of the enterprise. If $9,000,000 of new money is to go in, then the company must have reasonable assurance that ability to earn on the readjusted capital shall not be denied. To this end the condition has been set down that the consummation of the plan shall depend upon the procurement of a modern service-at-cost franchise from the city indeterminate as to time. In this respect the proposal follows closely the lines on which similar settlements in Chicago and other cities have been brought about and follows the precedent established by earlier grants in Cleveland, Rochester, Toledo and other cities.

The Insulls, under whose auspices the plan is advanced, have a genius for carrying out rehabilitations of this kind, but they are not magicians. They do not produce something from nothing, although at times the results they have achieved with seemingly hopeless material have been amazing. The Legislature must act on the matter, but if the members of that body and of other bodies charged with civic responsibility are endowed with acumen, they will lose no time in seeking to fulfill their part of the obligation. The spending of $9,000,000 should make the local Indianapolis system one of the finest in the country. After what Indianapolis has endured in the past, there would seem to be only one answer to the choice of the city between the prospect of continued penury for its local transportation system as now constituted and pride at that system's prospects under the plan proposed.

Getting the Most Out of Improvements

WHEN new devices are offered by the manufacturers, emphasis usually is placed on the improvements that can be effected if full use is made of them. For instance, modern railway motors and control can start and accelerate street cars at rates as high as 3 m.p.h.p.s., and do it hour after hour and day after day. Brakes are available that can stop cars even more quickly. These rates are practically twice as great as those standard ten years ago. Other equipment has made corresponding advances in efficiency. The arguments that can be advanced in favor of the use of such modern devices make the progressive manager feel that he cannot afford to get along without it.

But when the new apparatus is bought and placed in service it does not always give anything like the results that were anticipated, and so may become a bitter disappointment. All too often the operating forces, with long training in antiquated methods, fail to grasp the real purpose of the new designs, which is not merely to replace the old with something just as good, but through the use of something much better, to make possible an entirely new plan of service. The men, not used to the new way, sometimes are afraid to see what they can do if full opportunity is taken of the improvement. Again, there is a tendency to make only partial use of it, holding the full value in reserve for an emergency. What they need is careful instruction by men who are fully competent to give it, and who are fully conversant with the possibilities of the new equipment and of its peculiarities as well. The supervisory forces must understand, for instance, that new cars cannot be placed a few at a time on routes on which there are many old cars, so that the new ones cannot show what they can do. So it is with shop tools and devices for track construction.

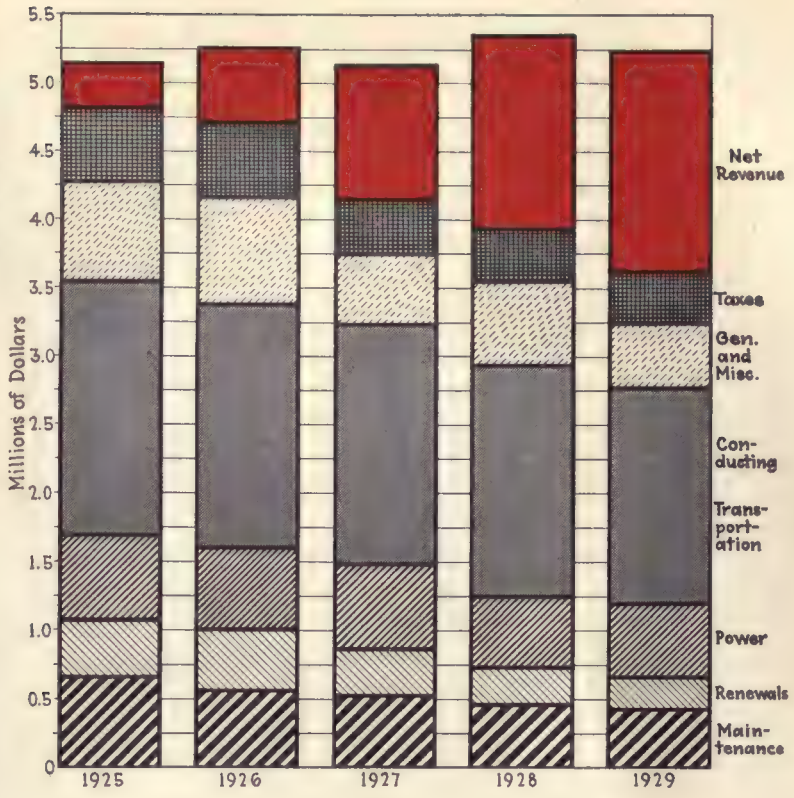
Sometimes this failure to see that equipment alone cannot effect the improvement is not confined to those in the ranks; it may go through the management. All in authority must be in sympathy with the purpose behind the installation, or the result will be that seen on one property when cars with full safety equipment were purchased some ten years ago on order of the state utility commission. The general manager, asked about the advantages to be obtained, stated that they were questionable, but that in a few months the special devices would be out of order anyway, and then everyone would go about his business and be satisfied. Thus it is easy to see that the cars were doomed to failure even before they were received.

So when improvements are planned it is essential to be sure that everyone from the top to the bottom of the organization is fully "sold" on them and is willing to do his full share in getting the most out of them. Otherwise, there is little value in spending good money for changes that will largely fail of their purpose.



Good Track Layouts Facilitate Routing in Atlanta

On Marietta Street in the downtown business section of Atlanta, the railway department of the Georgia Power Company has several unusually complicated layouts of special trackwork. At the intersection of Marietta and Broad Streets is a grand union. One block to the west is a double track crossing with four connected branch-offs. This layout is further complicated by the necessity to bend the Marietta street tracks outward around a statue located in the center of the street a short distance away from the intersection.



Savings in operating expense have been made consistently in every department of the railway system. As a result, the net has gone up five times in five years

Net Revenue Increased

400 PER CENT IN FIVE YEARS

Is Atlanta's Accomplishment

Large purchases of new cars, improvements in other departments and a general gain in efficiency are features of a ten-year program of modernization that has brought great financial results

FINANCIAL benefits that will accrue from carrying through a program of modernization and adaptation of a transportation system to the needs of the times are well exemplified in the record of the railway department of the Georgia Power Company during the past ten years. Not only have improvements been made, but careful planning has been done in order to get the best results from every expenditure of effort or of money.

Back in 1921, when the present railway management took charge of the property, the system was in relatively poor physical condition, and the operating methods were not of the best, even according to the standards of that day. It was seen at once that a great deal of rehabilitation work would have to be done before it would be possible to give a type of service even approaching that which it was felt must be furnished in order to maintain the revenue at a point which would permit of profitable operation.

One of the first moves of the management was to improve the rolling stock. Accordingly, a purchase of cars was made at once, and a definite program was adopted so that further purchases of modern cars have followed consistently until, today, the average age of the cars on the property is only about seven years. As the new cars were received, the obsolete ones were retired and destroyed. At the end of 1929 there was a total of 405 cars of all types on the property. Most of the 374 active passenger cars included in this total have been bought in the last nine years. Against this, 285 cars have been retired since Jan. 1, 1923.

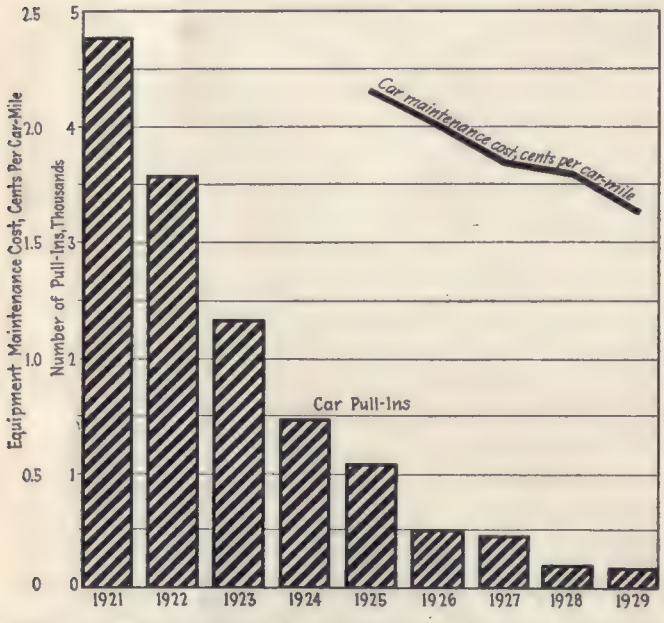
Soon after the decision to modernize was made, the company began laying out a definite program of improvements. The Beeler organization, of New York City, was engaged to make a detailed study of the property with a view to determining the proper routing, scheduling, and methods of operation to bring the standards up to what it was felt the public demanded. In the main, the changes

that have been made during the past several years have been based on the recommendations contained in that survey. During the entire period the operations of the railway system have been conducted under the leadership of Frank L. Butler, vice-president of the Georgia Power Company and manager of its railway department.

Naturally, the greatest interest in the results centers in the Atlanta division of the railway system. This is by far the largest unit, carrying approximately 90 per cent of the total passengers last year. Operating results for the Atlanta division are given in the accompanying table and chart. With revenues increasing slightly, it has been found possible to reduce operating expenses sharply in every department. The total operating cost last year was approximately 25 per cent less than it was in 1925. As a result, the operating income after taxes has gone up from $321,294 in 1925 to $1,607,166 in 1929, or just five times as much.

Similar comparisons for the other divisions over the five-year period are not available. The results for 1929 as compared with the previous year, however, show a general improvement, so that the net revenue for the entire railway system has gone up more than $200,000. Of this increase, $25,000 was on the divisions outside of Atlanta.

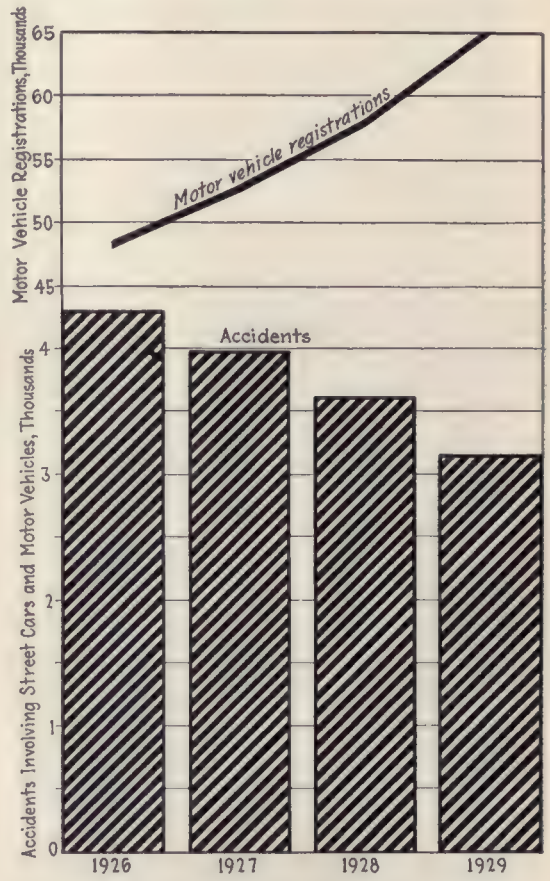
When looking for the reasons for this remarkable show-



With a remarkable record for reliability of the cars, equipment maintenance costs have been reduced sharply

ing, one is struck by the great improvement in operation shown throughout. Of particular importance is the increase in reliability of the car equipment. There has been a progressive reduction in car failures over the five-year period that has brought the company up from one of the poorer ones to the leader in its territory in this respect. Last year there were only 156 car failures as against 169 in 1928. In other words, the cars were operated 83,861 miles per pull-in last year and were maintained at a cost of 1.62 cents per car-mile, as against 77,664 miles per pull-in in 1928 at a cost of 1.79 cents per car-mile. That this was not a sporadic effort was seen in the continuing reduction in maintenance cost per car-mile from 2.15 cents in 1925, and a decrease in pull-ins, the average miles per pull-in that year having been 12,226. The result is shown graphically in one of the charts.

In connection with the above comparison, it must be borne in mind that, while the car-miles operated have been practically the same from year to year, the motor-miles have increased from 40,424,174 in 1925 to 49,265,076 in 1929 on account of the use of a greater proportion of four-motor cars. Included in the 285 cars retired since 1922 are all of the single-truck cars as well as the older double-truck cars, many of which were equipped with two motors. Some of the cars have been rebuilt and some converted into one-man safety cars.



Accidents involving motor vehicles have gone down despite a large increase in registration in the county

New motors and control have been installed in a number of instances, but purchases of new cars were responsible for the major improvement in reliability and low maintenance cost.

In the way department construction and maintenance work were carried on at about the same rate last year as in the past several years. By careful planning it was found possible to reduce costs below the budget. Roadway payrolls have been reduced from previous years. As an example of the improved quality of workmanship, the electric switches in 1929 made a record of 102,160 operations per failure as compared with 80,271 in 1928. The unit cost of maintaining these switches, however, went down from $55.18 to $44.63, a decrease of 19.1 per cent.

In the conducting transportation account there has been a marked reduction in cost during the past five years. This has come from the gradual introduction of one-man cars, from an increase in schedule speeds, a reduction of accidents and a revision of the personnel for greater efficiency. During the past year the Pryor Street and Central Avenue viaducts were completed and opened for service. Several car lines were rerouted to take ad-

Revenues and Expenses, Atlanta Street Railway Lines of the Georgia Power Company, 1925-1929

Revenues	1925	1926	1927	1928	1929
Passenger	$5,052,378	$5,161,958	$5,034,237	$5,276,705	$5,143,871
All other	82,541	95,356	92,861	86,038	89,737
Total revenues	$5,134,919	$5,257,315	$5,127,098	$5,362,744	$5,233,680
Expenses					
Maintenance	$667,929	$569,232	$529,396	$462,995	$437,427
Renewals and replacement reserve	409,016	443,153	334,315	271,183	227,364
Power	618,590	595,088	618,710	547,034	548,052
Conducting transportation	1,837,931	1,772,888	1,750,061	1,649,817	1,563,511
Traffic	11,702	19,269	1,300	412	1,290
General and miscellaneous	730,881	763,689	518,106	628,758	473,032
Total operating	$4,276,049	$4,163,319	$3,751,888	$3,560,198	$3,250,675
Net revenue, railway operations	858,869	1,093,995	1,375,210	1,802,545	1,982,933
Taxes	537,575	541,579	403,181	370,926	375,766
Operating income	$321,294	$552,416	$972,029	$1,431,619	$1,607,167

vantage of them, saving a number of turns in the center of the city. Enough cars suitable for one-man service have been obtained so that they now are operated in the base service on all city lines but one, on which the fare situation makes their use impracticable.

The changes in methods of operation were made with no labor turnover. Transfers of men from one service to another provided for all the additions and took care of those men displaced by extension of the use of one-man cars. So few men retired, left the service or were discharged that it was not necessary to hire any new men in the transportation department during last year.

The accident situation has shown a marked improvement. In the fall of 1926 accident prevention work was centralized under a safety director. Since then there has been a steady reduction in accidents of all classes from 6,247 to 4,180 in 1929, or 33 per cent. This result has been accomplished while there was an increase in registration of motor vehicles amounting to 33.8 per cent. Nevertheless, all accidents in which street cars and motor vehicles were involved have gone down 27.2 per cent. This result has been accomplished by careful instruction and follow-up work.

Many of the methods which have contributed to the great improvement in operation have been discussed in this paper from time to time. A complete summary of the achievements of the management at the time was given in the brief submitted in the Charles A. Coffin competition in 1927. This brief was abstracted in the JOURNAL, Dec. 31, 1927, page 1180. At that time, the projects were just coming into fruition. Now, three years later, the benefits have not only been retained, but in almost every department the records made then have been exceeded by a wide margin.



Downtown business section of Atlanta showing in the foreground the new Pryor Street viaduct which has made possible an improvement in service and a gain in schedule speeds



Wing plow of the International Railway, Buffalo, pushing back snow to the curb line

SNOW REMOVAL

PROBABLY no emergency condition under which a railway is forced to operate demands faster or more efficient handling than that caused by a snowstorm. Preparedness in organization and equipment for snow removal, consequently, is one of the fundamental efforts of many railways. The following survey of snow-fighting methods used by more than a dozen companies in the United States and Canada shows that such preparation is effective and assures, in nearly every instance, the continuance of normal operation and service.

Notable progress in snow-removal practices has been made during the past two decades, not only by the railways but by city street departments as well. Gradually a closer co-ordination of effort on the part of these two agencies has resulted in a more effective distribution of the work to be done and a more economical use of machinery and labor utilized by each. Yet, under franchises, ordinances and operating agreements the railways continue to bear a great part of the expense of snow removal, not only from their own track areas but from the entire roadways used. A general survey of the operating arrangements in most cities shows that the railways are required to clear the snow and ice from their track areas at their own expense. In addition to this, they are charged a percentage of subsequent removal of the snow by the city's forces. Where this particular arrangement does not exist there is usually an alternative obligation whereby the railways completely clear snow and ice from certain streets and the city uses its equipment and forces on other main arteries.

Various bases and scales are used upon which the charges for subsequent removal, after clearing, are made. In Montreal, the Montreal Tramways is required to pay half of the cost of removal. In Minneapolis, the Twin City Rapid Transit Company under agreement pays $\frac{18}{40}$ of the total cost of the removal of snow on a 40-ft. street, and $\frac{18}{60}$ of the total cost on a 60-ft. street. In St. Paul, this company is required to pay $\frac{1}{3}$ the cost of removing snow from any street on which there is a car line. The Toronto Transportation Commission, after clearing the snow from its tracks, is required to pay $\frac{1}{3}$ of this cost, while, under three fran-

In northern United States and Canada, where the snow and ice problem is greatest, railways are continually improving methods and equipment. Conditions and practices on twelve properties are summarized



With both wings in action, this plow of the Montreal Tramways clears a path 18 ft. 6 in.



At left — Heavy-duty plow of the Twin City Rapid Transit Company

chises, the Duluth Street Railway pays for removal based upon the number of inches of snowfall reported by the U. S. Weather Bureau. Different operating arrangements are listed in the table accompanying this survey.

Because the problem of snow removal is a major one on the properties covered by this study, equipment, such as plows, sweepers and ice-cutters, as well as methods of organizing the actual work itself, has been given the utmost attention. Machinery has been developed to meet extreme conditions and to stand hard work. An example is the equipment used by the Montreal Tramways. Ten single-truck wing plows have been developed to accomplish two main purposes, clearing tracks of snow during storms and cutting down the ice which builds up on the devil strip from time to time during the winter season. With both wings in action, the effective snow clearing path of these plows is 18 ft. 6 in.

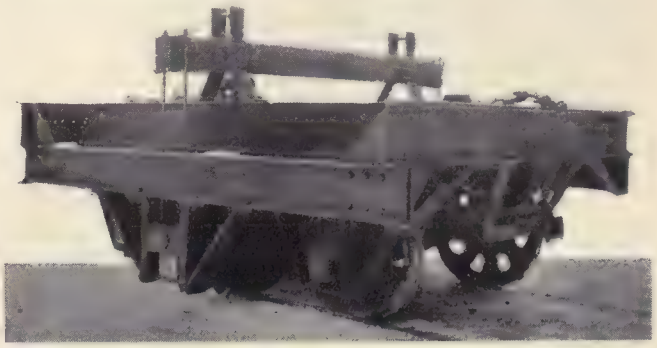


Rotary plow in action on the Wilkes-Barre Railway

The essential features of these plows are: (1) The strong, curved steel side wing, pivoted on the heavy vertical shaft at the front of the plow, and adjustable for height as required. This wing was carefully designed so that at operating speed the snow is effectively rolled back to the end of the wing. The wing is power-operated through a clutch on the driving motor by a rack and pinion with a connecting rod with universal joint attached to the back of the wing. This feature permits of easy movement of the wing allowing it to be used to advantage during storms in heavy downtown traffic. (2) The ice cutter on the devil strip, which consists of a heavy steel casting with inserted hardened teeth, is also pivoted on a vertical shaft. This cutter which, when not in use, folds back against the side of the plow, is hand-operated through a vertical shaft and chain



Adjustable hood and blades are features of the Wilkes-Barre rotary plow



Ice cutter built by the Duluth Street Railway to remove high centers

Comparative Data on Snow Removal Practices and Equipment

Railway	Operating Obligations Imposed by Franchise, Contract or Agreement	Snow Fighting Equipment Used on Street Car Routes	Materials and Methods Used for Keeping Track and Switches Open	Equipment Used on Bus Routes	Materials and Methods Used on Icy or Slippery Streets	Wages Paid for Snow Removal and Sanding Work
Montreal Tramways Montreal, Canada. Track-miles..... 302 Bus-miles..... 38	Company must keep tracks free from snow and ice. City removes snow from entire street, company paying one-half cost of carting.	35 single-truck sweepers. 7 double-truck sweepers. 2 double-truck rotary plows. 3 single-truck rotary plows. 10 single-truck wing plows. 11 salt cars.	Salt only. Applied by switchmen or hill-men at regular stations. For switches salt is mixed with snow. Salt cars are operated.	None. City cleans and removes snow from bus routes.	City uses cinders and sand, spreading by hand. Company spreads cinders by hand and sand with a mechanical spreader.	5 cents advance on regular rates to all employees on cars for snow removal. Does not apply to hill-men or switchmen.
Twin City Rapid Transit Company Minneapolis, Minn. Track-miles..... 520 Bus-miles..... 110	Company must remove snow from tracks. Under agreement company pays 19/40 of total cost of removing snow from a 40 ft. street and 19/60 from a 60 ft. street. In St. Paul pays ¼ cost of removal on any car line street.	19 plows. (Described in survey).	Tracks and switches are thoroughly greased. Salt and gasoline are used for melting snow and ice.	None. City or county removes snow from bus routes.	Sand hauled in a motor truck and spread by hand only on necessary locations.	Regular rates.
Toronto Transportation Commission Toronto, Canada. Track-miles..... 255 Bus-miles..... 570	Commission plows track area. City removes snow from entire street, charging commission one third of total cost.	24 single-end sweepers. 4 double-end sweepers. 2 rotary plows. 4 work cars fitted with blades.	Switches are cleaned and salted at least twice daily.	3 Walter plows with cinder box. 1 Walter plow with wrecker. 1 Walter plow with dump body. 1 Walter plow with sander. 1 Fordson tractor plow. 2 sanders.	Commission cinders all bus stops. City sands hills along street car routes.	2 cents per hour additional to car sweepers and plow operators only; gasoline equipment operators and laborers regular rate. No overtime paid.
Duluth Street Railway Duluth, Minn. Track-miles..... 114 Bus-miles..... 35	Under three franchises, company removes snow and ice from tracks. City subsequently removes snow from entire roadway charging company a sum based on snowfall record of U. S. Weather Bureau.	5 railway plows. 2 double-end detachable plows on street cars. 4 single-end detachable plows on work cars. 3 detachable plows on motor trucks. 1 heavy ice cutter.	Calcium chloride on hard surface streets. Salt on unpaved streets. Applied by hand.	None. City or county removes snow from bus routes.	Cinders, fine gravel or sand. Usually use tire chains only on hilly routes.	Snow equipment crews, regular rates plus 25 per cent. Switchmen regular rates.
International Railway Buffalo, N. Y. Track-miles..... 450 Bus-miles..... 90	Franchise requires company to clear right-of-way and pay 25 per cent of subsequent removal. In practice equipment has been designed to remove snow from curb to curb on car line streets.	30 plows. 23 sweepers. 1 ice cutter.	Sand and cinders used on track. Salt on switches when necessary for melting snow.	18 sanding trucks. City removes snow from bus routes and company follows with sanders.	Spreads sand and cinders by mechanical devices. Under extreme conditions, salt is used.	Two-man rate for platform service plus half time.
Winnipeg Electric Company Winnipeg, Canada. Track-miles..... 121 Bus-miles..... 23	Company responsible for snow removal from tracks and 18 in. outside. If city engineer decides it is necessary, company must clear streets from curb to curb.	10 sweepers. 2 plows.	Sand on rail. Salt in switches for melting snow.	1 motor-driven plow and planers. City responsible for removal but company assists.	Cinders and sand spread at bus stops. Work is done by hand.	Regular rates.
United Electric Railway Providence, R. I. Track-miles..... 263 Bus-miles..... 161	No franchise obligations. Arrangement whereby company cleans and removes snow from certain designated streets and the city others dates back to old franchises.	3 sweepers. 46 plows.	Switches are kept salted during snow storms. Some calcium chloride used.	1 blade plow on a 5-ton truck. 5 sanders. City and county remove snow from bus-routes.	Sand applied by mechanical spreaders.	15 to 20 cents per hour in addition to regular rates. Sanding work for buses done by night track crew at regular rates.
Department of Street Railways, Detroit, Mich. Track-miles..... 435 Bus-miles..... 490	Railway dept. cleans and removes snow from all car and bus routes.	14 sweepers. 11 plows.	Salt.	Walter plows. Handy Andy sand spreaders.	Cinders and salt or sand and salt spread mechanically.	$1.00 per hour as compared to regular rates of 67 cents, 71 cents and 75 cents.
Springfield Street Railway Springfield, Mass. Track-miles..... 133 Bus-miles..... 99	By agreement with city, the company removes snow on certain streets from curb to curb. This is equivalent to total track area throughout city.	11 sweepers. 1 rotary plow. 7 plows.	Salt	None	City sands hills. Work is done by hand.	Time and one half for snow equipment work. Regular rates for sanding.
Cleveland Railway Cleveland, Ohio. Track-miles..... 403 Bus-miles..... 90	No franchise obligations. Company clears snow from track areas. City assists in downtown sections.	28 sweepers. 20 plows.	Salt.	Good Roads Machinery, 6 cu.yd. spreaders.	Salt mixed with sand spread mechanically. In extreme cold calcium chloride is used.	Time and one half for snow equipment work. No increase for sanding or salt work.
Pittsburgh Railways Pittsburgh, Penna. Track-miles..... 592 Bus-miles..... 126	No franchise obligations. City cooperates in downtown congested areas by cleaning snow and ice from street car stops.	39 sweeper cars. 17 scraper cars. 3 Fordson tractor plows. 3 auto trucks with plows.	Switchmen working in two-man crews and equipped with trucks or motorcycles clean and oil switches, spreading salt around them.	None	Granulated slag or cinders and salt mixed.	Regular rate plus 10 cents per hour if during working period. Overtime work, time and one half based on 80 cent per hour rate, extra men time and one half on 70 cent rate.
Eastern Massachusetts Street Railway Boston, Mass. Track-miles..... 610 Bus-miles..... 219	General practice, railway clears snow from tracks and levels at side. In some cases, city does subsequent removal, in others removal is done by railway.	62 plows. 39 sweepers. 1 ice breaker. 21 cars equipped with Root scrapers. 6 cars equipped with rotating broom under body.	Salt.	Best tractors. Walter tractors. Plows attached to trucks.	Sand spread from trucks by hand.	12 cents per hour in addition to regular one man rate. Automotive snow removal done by track or line department at regular rate.

drive. In its working position this wing is braced from the rear by a sliding shaft held by a wooden dog, which will be sheared off if the cutter encounters very heavy ice or some solid obstruction. This permits the wing automatically to fold back to position against the side of the plow. The same protection is provided for the main side wing.

The usual operating height for the wing above the rail level is 2¼ in., but, where street surface conditions are known to be good, this can be reduced to as low as 1½ in. with advantage. The floor of the plow body is weighted with concrete to make available the full tractive effort of the two 50-hp. motors.

During the past winter, an unusually severe snowfall, accompanied by high winds and drifting snow for a considerable period, forced the Montreal Tramways to make improvements on equipment previously used on suburban lines. Deep cuts with vertical sides from 8 to 10 ft. high were formed over several miles of suburban track by the rotary plows. These cuts would be refilled by drifting snow within a very short time after the passage of the rotary. Two special plow equipments were designed with concave wings, 18 ft. long by 30 in. wide. These are hinged from a point about 5 ft. behind the rear truck. A chain tackle, hung from the hinge post, permits of a heavy steel wing being set at any desired angle from the plane of the rails. It can also be swung out at any angle in a horizontal direction, and held in position by chains. The free end of the wing points forward and thus pulls the snow on to the track instead of pushing it away, piling it up behind the rear truck, to be picked up and spread out over a wide area by a rotary plow following close behind.

The vertical sides of the bank, after several passages, are thus transformed into clean, smooth slopes at an angle of about 20 deg. from the horizontal. This contour allows drifting snow to be blown wide across the right-of-way instead of being pocketed between the vertical sides of the cuts. The final cleaning is done with sweepers.

The Twin City Rapid Transit Company has built nineteen snow plows in its own shop. They weigh approximately 80,000 lb. each. Trucks are equipped with four GE-73 motors, geared for slow speeds. The nose of the plow is hinged to a heavy frame in such a way that it can rise when it strikes rough track or hard paving blocks. Immediately back of the nose is a combined scraper and steel broom. Both the nose and the scraper broom are air-controlled, as is also a small extension to the plow nose. On the side of the plow is a large wing which throws the snow about 12 ft. beyond the outside rail. This wing is pulled in and out by means of an electrically operated windlass, and is raised or lowered by means of an air cylinder. Between the front and rear trucks is another air-operated combined steel broom scraper consisting of 5,200 steel cutting points which are very effective in removing ice.

An ice cutter used by the Duluth Street Railway is shown in an accompanying photograph. It is used on car lines to cut down high ice ridges formed along and between street car rails. The cutter consists of a heavy steel cylinder, with cutter teeth or flanges inserted, which is mounted on a special car truck. This apparatus is either pushed or pulled by snow plows or work cars.

A rotary snow plow used by the Wilkes-Barre Rail-



Toronto Transportation Commission snow plow at work on Lake Shore Road



Street signs used in Montreal to warn motorists against parking during progress of snow removal



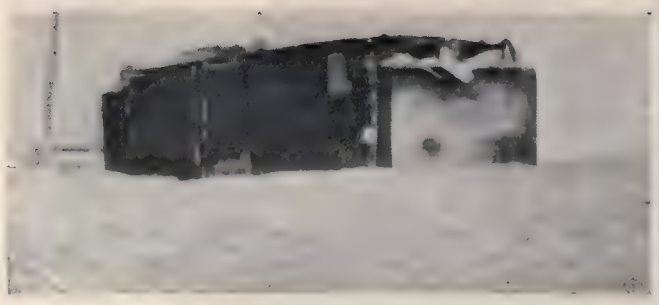
Highway plow and sander used to clear T.T.C. bus routes



Snow plow mounted under interurban car of the Winnipeg Electric Company



Type of double-truck sweeper used at Springfield and Worcester, Mass.



Rotary plow in action at Winnipeg



Clearing suburban lines of the Eastern Massachusetts Street Railway

way is also shown in two illustrations. The apron on this plow is adjustable and can be raised or lowered as desired. When the plow is in operation, this apron should be adjusted to about the height of the rail, and when running light should be lifted so as to pass any obstruction in the track. The blades of the fan are adjustable to any pitch, so as to compensate for the density of the snow. The fans are operated by means of separate motors. There are two openings in the top of the housing, either one of which can be used according to the location. This plow is particularly applicable to interurban work as it throws the snow or any object it might pick up for a considerable distance.

A comparison of street car and bus mileages with the snow-fighting equipment used to cover them is given in the table on page 678.

Salt, either used alone or mixed with sand or cinders, is the material most generally used for keeping switches, special work and tracks in operating condition. In most cases, salt is applied by hand by switchmen who have regular routes to cover. Calcium chloride is used to some extent by some companies. In Duluth, the railway company uses calcium chloride in streets having hard pavements and salt in unpaved streets.



Plow used for snow removal in city streets in Buffalo

In Minneapolis, salt and gasoline are used and switches are thoroughly greased during a snowstorm. For keeping tracks in good operating condition when there is a tendency to bad slippery rail, the Montreal Tramways operates special salt cars over the routes, which deposit the salt along the rail. In Pittsburgh, switches are kept in operating condition by switchmen equipped with trucks or motor cycles and side cars, who operate on regular routes, each crew of two men having approximately the same number of switches as the other crews. Switches are swept out and oiled and a small amount of salt is placed around them to prevent freezing.

As opposed to the obligations imposed by cities for the removal of snow and ice from street car routes, responsibility for the cleaning and removal of snow on bus routes is carried, in most instances, by the city or county authorities. Columns 5 and 6 of the table on page 678 compare the practices and equipment used on bus routes as well as the materials and methods used for safeguarding bus operations on slippery streets.

Costs, although not uniformly given, definitely show to what extent the companies included in this survey are required to go in the way of snow removal work and sanding. The Montreal Tramways' snow removal cost for the calendar year 1929 was $460,887, or 1.56 cents per car-mile. Track cleaning and sanding for this year amounted to $95,819, or 0.32 cent per car-mile. In Minneapolis, the Twin City Rapid Transit Com-



Heavy plow and scraper equipment developed by the Milwaukee Electric Railway & Light Company. Air-operated wing permits rapid movement

pany's cost for snow removal and sanding per single track mile during 1929 was $210, making the cost per car-mile 0.33 cent.

The average cost per mile of track for cleaning street car routes in Toronto for the past five years, 1926-1930 inclusive, was $799, and the average cost for cleaning bus routes was $576 per mile. The approximate cost per mile for 1930 was $854 for cleaning street car routes, and $633 for bus routes. As compared to this, the Pittsburgh Railways' cost per mile of track per year for removing snow and ice is $31, for sanding track made necessary by snow and ice, $45.

In 1929, the United Electric Railways, Providence, R. I., operated 12,098,000 car-miles and 4,199,000 bus-miles. The total cost of car snow work was $35,084, and of bus snow work $3,359, making the cost of car-mile 0.29 cent and per bus-mile 0.08 cent. The Duluth Street Railway's cost for snow and ice removal during 1929 was 0.34 cent per car-mile. In terms of snow vehicle-miles, the Cleveland Railway snow removal operation cost from 50 to 55 cents per car-mile.

Swiss Scenic Railway Electrified

ZERMATT, the famous Swiss town at the foot of the Matterhorn, is now reached by an electric railroad. The line between Visp (Viege) and Zermatt recently has been electrified. The line was opened with steam power in 1881. At Visp the trains connect with the Swiss Federal Railway electric express trains on the Simplon route, which runs between Lake Geneva and Visp, Brig and Italian points. The electric trains on the Lötschberg route connect the Bernese Oberland with Brig. In order to make a connection with them, the Visp-Zermatt line has been extended from Visp to Brig, and through trains are now operated from the latter point to Zermatt.



A train on the newly-electrified Visp-Zermatt Railway at Neubrűck near the foot of the Matterhorn

A.I.E.E. Meeting Considers Railroad Electrification

Several important papers presented at technical session on this subject. Inspection trips made to important projects in Philadelphia and vicinity

RAILROAD electrification was one of the major topics at the sixth Middle Eastern district convention of the American Institute of Electrical Engineers held at Philadelphia, Pa., Oct. 13-15. One entire session was devoted to the subject, and several inspection trips were made to local installations.

Six important papers were presented at the technical session on electrification held Wednesday morning, which was presided over by G. I. Wright, engineer electric traction the Reading Company.

C. L. Doub, assistant engineer of the same company, presented a discussion of the power supply facilities for the suburban electrification which is now being installed by the Reading in Philadelphia and surrounding territory. The facilities are being planned so that the electrification may readily be extended to include through passenger and freight service between Philadelphia and New York City, Bethlehem and Reading, Pa. Contract has been made with the Philadelphia Electric Company for initial power requirements, and provisions are made for enlarging such supply to serve all of this territory.

The railroad is constructing substation and transmission facilities to serve the suburban territory by a 12,000-24,000-36,000-volt, three-wire, single-phase, 25-cycle distribution system, with the view to reaching the more remote area by superimposing 66,000-volt transmission lines upon the initial system at the time of future extensions. The present and proposed layouts are described in the paper together with the estimated power requirements and the manner in which the railroad system is to be served from the power company network.

Utilization of railroad right-of-way for electric power transmission and co-ordination with railroad electrification was the subject of a paper by W. W. Woodruff, superintendent of aerial lines Philadelphia Electric Company, and G. I. Wright, engineer electric traction the Reading Company. It was pointed out that the use of the Reading right-of-way made feasible the entrance into the heart of Philadelphia with overhead transmission at high tension of the power required for many industries. The difficulties that were encountered and the financial and management problems that had to be solved were considered in some detail. It was pointed out that a prime requirement was that the operation of the railroad or its future expansion should not be hampered, while the electric companies interested should obtain a permanent right-of-way where the securing of an independent route would be practically out of the question.

Steps taken in initiating the Pennsylvania Railroad electrification in the Philadelphia district were explained in a paper by H. C. Griffith, assistant electrical engineer of that railroad. The operating practice, the functions of the power director and those associated with him in switching and grounding circuits for safeguarding the personnel were discussed.

Other papers presented included a description of the substations for the new Broad Street subway by H. M. Van Gelder, electrical engineer department of city transit, Philadelphia; use of oil-electric or gas-electric locomotives and motor cars as an adjunct to electrification, by A. H. Candee, Westinghouse Electric & Manufacturing Company; and modern single-phase motors for railway electrification, by F. H. Pritchard and Felix Konn, General Electric Company.

Following the presentation of the papers, a lively discussion took place. Sidney Withington, New Haven Railroad, called attention to the rapid development of mercury vapor rectifiers for railway service within the year, mentioning particularly their use on the Lackawanna. While use of the railroad right-of-way for power transmission is very interesting, he feels that the railroads must be careful not to permit construction that will in the future impose restrictions on track developments. In connection with the load curves for the Reading shown by Mr. Doub, he pointed out that the load factor of an electrification can be increased greatly by inclusion of freight service, most of which is handled in the non-peak hours.

J. V. B. Duer, electrical engineer Pennsylvania Railroad, sees only a small field for self-propelled cars on electrified systems. The improvements in single-phase motors he considers are of great importance.

J. H. Davis, electrical engineer Baltimore & Ohio Railroad, regretted that no reference was made in the papers presented to inductive co-ordination. In the future, greater attention will be given to the joint use of railroad rights-of-way, he believes.

Other speakers taking part in the discussion included R. A. Hentz, Philadelphia Electric Company; H. L. Andrews, General Electric Company; F. H. Shepard and C. E. Skinner, Westinghouse Electric & Manufacturing Company; F. W. Harvey, Gibbs & Hill; H. M. Van Gelder, city transit department, Philadelphia, and J. J. Linebaugh, Jackson & Moreland.

On Tuesday afternoon, the Pennsylvania Railroad placed a special train at the disposal of the delegates, and an inspection was made of the improvements in the Philadelphia district, including the new passenger station and the Lamokin Street substation. Wednesday afternoon the Reading Company provided a special train for inspection of the progress of its electrification, the trip including the overhead construction between Reading Terminal, Wayne Junction and Jenkintown, the substation of the Philadelphia Electric Company at Plymouth Meeting, and the 66,000-volt transmission line of the latter company over the Reading tracks between Conshohocken and Philadelphia. At Oreland, a demonstration of stringing trolley for a two-wire catenary system was given.

The attendance at the meeting was more than 500.



Multiple-unit electric trains of this type on the Lackawanna Railroad operate on schedules 25 per cent faster than those of the former steam trains

SCHEDULED SPEED

Increased by Electrification

Rapid acceleration and braking rates of new electric trains have enabled Lackawanna Railroad to reduce running time by approximately 25 per cent between Hoboken and stations in suburban zone. Free running speed also higher than that of steam trains formerly operated

SUBSTANTIAL reductions in running time in electrified suburban service were made by the Delaware, Lackawanna & Western Railroad on Sept. 28, coincident with the change from daylight-saving time to Eastern standard time. This increase in scheduled speed has been made possible by the rapid acceleration and braking rates of the new multiple-unit electric trains, as well as their higher free running speeds as compared with the steam trains formerly operated.

The new schedules affect the electric service between Hoboken and South Orange on the main line, and between Hoboken and Montclair on the Montclair branch. Substitution of electric trains for steam trains on the Montclair branch began early in September, and was completed about the middle of the month. The changeover of the Hoboken-South Orange service on the main line was then commenced. This was completed just prior to the inauguration of the new schedules. Steam operation has been continued for the present to points west of South Orange, and no change has been made in running time. It is expected that electric service will be in operation on the main line as far as Dover and on the Passaic and Delaware branch to Gladstone by about the first of next year. Faster schedules will then be inaugurated for these services.

With the change in schedules, the average running time westbound between Hoboken and Montclair was reduced from 34 minutes to 27 minutes, which is equivalent to an increase in speed from 23.1 m.p.h. to 29.2 m.p.h. The running time of the fastest train was reduced from 27 minutes to 21 minutes, with a corresponding increase in speed from 29.2 m.p.h. to 37.5 m.p.h. Eastbound, the average running time was reduced from 30½ minutes to 26 minutes, with a corresponding increase in average speed from 25.8 m.p.h. to 30.1 m.p.h. The running time of the fastest express from Montclair to Hoboken was reduced from 23 minutes to 19 minutes, while the speed was increased from 34.2 m.p.h. to 41.3 m.p.h.

It will be noted that the average time saving is greater in the westbound service than in the eastbound, being seven minutes in one instance and only 4½ minutes in the other. This is due to the fact that there is a fairly heavy grade westbound between Newark and Montclair. The greater ease of starting the multiple unit electric trains as compared with the steam trains has made possible a considerable saving in time westbound. On the east-

Comparison of Schedules, South Orange Service

Running Time, Minutes	Number of Trains* Eastbound Schedule New	Old	Westbound Schedule New	Old
24	1	.	1	..
25	4	..	1	..
26	1	.	..	..
27	2	..	5	..
28	15	.	3	.
29	.	.	12	..
30	1	..	3	..
31	1	1	..	..
32	1	..	1	2
33	..	2	..	..
34	.	3	..	1
35	..	4	.	1
36	..	6	.	6
37	..	1	..	2
38	..	4	..	8
39	..	..	..	1
40	..	4	..	3
41	..	.	..	1
42	..	1	.	..
43	..	..	..	1
	26	26	26	26

*Does not include trains to and from points west of South Orange although many of these trains also serve territory between South Orange and Hoboken.

Effects of Electrification, South Orange Service

	New Schedule	Old Schedule
Average running time—east	27½ minutes	36½ minutes
Average running time—west	28½ minutes	37½ minutes
Average speed—east	30.2 m.p.h.	22.8 m.p.h.
Average speed—west	29.3 m.p.h.	22.3 m.p.h.
Express running time—east	24 minutes	31 minutes
Express running time—west	24 minutes	32 minutes
Express speed—east	34.8 m.p.h.	27.0 m.p.h.
Express speed—west	34.8 m.p.h.	26.0 m.p.h.

Effects of Electrification, Montclair Branch

	New Schedule	Old Schedule
Average running time—east	26 minutes	30½ minutes
Average running time—west	27 minutes	34 minutes
Average speed—east	30.1 m.p.h.	25.8 m.p.h.
Average speed—west	29.2 m.p.h.	23.1 m.p.h.
Express running time—east	18 minutes	23 minutes
Express running time—west	21 minutes	27 minutes
Express speed—east	41.3 m.p.h.	34.2 m.p.h.
Express speed—west	37.5 m.p.h.	29.2 m.p.h.

Comparison of Schedules, Montclair Branch

Running Time, Minutes	Number of Trains Eastbound Schedule New	Old	Westbound Schedule New	Old
19	1	..	..	..
21	1	..	1	..
22	..	..	1	..
23	..	1	1	..
24	1	..	1	..
25	1	1	1	..
26	20	..	3	..
27	6	..	21	2
28	1	..	4	..
29	2	..	..	1
30	..	16	1	2
31	..	7	2	1
32	..	4	..	..
33	..	4	..	8
34	..	..	..	6
35	..	..	1	5
36	..	..	..	3
37	..	..	..	1
38	..	..	..	3
39	..	..	..	1
41	..	..	..	1
	33†	33†	37*	34*

*One additional train terminates at Watsessing Avenue Station.
†Four additional trains start at points east of Montclair.

bound down grade this advantage is less clearly evident. Despite the greater improvement in westbound running time, however, the average speed eastbound remains somewhat higher than the average speed westbound on the new schedule as it was on the old.

In the South Orange service, the average running time westbound has been reduced from 37½ minutes to 28½ minutes, corresponding with an increase in speed from 22.3 m.p.h. to 29.3 m.p.h. Eastbound the running time has been reduced from 36½ minutes to 27½ minutes, while speed has increased from 22.8 m.p.h. to 30.2 m.p.h. The running time of the fastest train was cut from 32 minutes to 24 minutes westbound and from 31 minutes to 24 minutes eastbound. Speeds were increased from 26 m.p.h. westbound and 27 m.p.h. eastbound, to 34.8 m.p.h. in both directions at present.

From these figures it will be seen that there is a saving of nine minutes in average running time in both directions for the South Orange service. This is somewhat greater than the saving for the Montclair service, because there are more intermediate stops where the advantages of multiple-unit operation are experienced. Between Newark and South Orange there is a slight grade westbound, enough to cause a slight difference in eastbound and westbound speeds, but not so pronounced as on the Montclair branch.

Generally speaking, the changes effected on the new schedules have reduced the running time approximately 25 per cent. This saving is utilized by the westbound trains to reach their destinations earlier. The eastbound trains, on the other hand, are scheduled to leave later and to arrive at Hoboken at approximately the same times as before.

The new schedules call for the operation of a substantially larger number of trains than were in operation a year ago. On the Montclair branch the number of daily trains westbound has been increased from 35 to 38, the additional trains being scheduled between 8 o'clock in the evening and midnight. The number of eastbound trains remains at 37. In the electric service between Hoboken and South Orange, the daily number of trains remains 26 in each direction, as it was on the old schedule. Many trains operating to points west of South Orange, however, serve also the territory between that station and Hoboken. In this connection it should be noted that a total of 38 additional trains were placed on the schedule last spring when electrification was under way but before electric trains commenced operation. These 38 trains have all been retained on the new schedule.

The increased comfort of travel as a result of electrification is marked and has elicited much favorable comment. The existence of a long tunnel just west of the Hoboken terminal was always an element of discomfort with the steam service, because headways were too short to allow the locomotive smoke and gases to leave the tunnel in the intervals between the passage of trains. This difficulty has been almost entirely eliminated with electric operation. Moreover the electric service is much cleaner and quieter than the steam service. This improvement is greatly appreciated both by the passengers and the residents of the towns along the line.



Suburban communities on the Lackawanna Railroad between Hoboken and South Orange and on the Montclair branch now have electric service



Some of the 20,000 taxicabs operated in the City of New York

Regulation of Taxicabs *as a Public Utility* RECOMMENDED IN NEW YORK

Report by Mayor's commission urges operation under a single franchise in co-ordination with all other transit agencies, and advises the issuance of certificates of convenience and necessity to a limited number

ESTABLISHMENT of the taxicab industry in New York City as a public utility, under the jurisdiction of a bureau of taxicab control in the Board of Transportation, was recommended in a comprehensive report made public recently by Mayor Walker's commission on taxicabs. The report recommends operation under a system of certificates of public convenience and necessity, to be issued by the new bureau to individuals and organizations who comply with strict standards of financial responsibility and public safety outlined in the report.

The report expresses the commission's strong conviction that the ultimate solution of the taxicab problem is is operation under a single franchise in co-ordination with all other local transit agencies. It urges that its recommendations be carried out with this goal in view. For the present, the report explains, the certificate system is advocated in order to protect the rights of thousands of owner-operators now engaged in the industry and to give them an opportunity to prepare for future changes.

Single Franchise Urged

The commission's belief in operation under a single franchise as the real cure for the present evils of the industry is voiced repeatedly. It is found in a "summary of conclusions" and also an "outline of facts" which are incorporated as separate divisions of the document. The certificate system is frankly described as a stepping

stone to a franchized monopoly, delayed out of consideration for the nearly 10,000 individuals now gaining a livelihood by operating their own cabs.

The commission on taxicabs was appointed by Mayor Walker last Spring after he had vetoed the Board of Alderman's taxicab ordinance which sought to increase the prevailing rates. It is headed by Frank P. Walsh, its other members being Leonor L. Loree, Philip Le Boutillier, Col. George W. Mixter and Daniel L. Reardon. The commission was assisted in its work by Leland Olds, economist, and J. I. Metcalfe, engineer. Its investigation of the industry in New York and in other cities is regarded as the most thorough ever undertaken by a municipality.

Among other things, the report recommends restriction of the number of cabs operating on the city's streets, adoption of the prevailing rate of 15 cents for the first quarter-mile and 5 cents for each succeeding quarter as a uniform rate, and the raising of the annual license fees for cabs to $50 and those for drivers to $10 a year.

The granting of certificates of convenience and necessity only to those operators who can show financial ability to meet all liabilities, as well as ability to operate on sound business lines is urged. It is also recommended that the Board of Transportation bureau have wide regulatory power. The bureau would have the power to fix uniform rates and service standards, grant and revoke certificates, approve and revoke transfers of certificates, and determine prior rights on cab color schemes, the adoption of which is suggested as a preliminary requirement for a certificate. The report also urges that the bureau be empowered to investigate accidents, prescribe submission of regular reports and adoption of a uniform system of accounts by certificate holders, establish a hack stand program, set up conditions of labor and qualifications for drivers, conduct investigations, and, in general, exercise all power required for effective regulation of the industry.

Would Reduce Number of Cabs

An important recommendation of the commission calls for issuance of certificates to the 19,000-odd cabs now operating, but terminable to them when they go out of business, that period in no case to exceed three years. The report suggests that about 14,000 cabs are sufficient to meet the city's present needs.

A preliminary statement embodied in the transmitting letter which sent the report to Mayor Walker described the general situation found by the commission as the result of twelve public hearings, held during the past summer, and the private investigations which followed.

"Your commission finds the taxicab industry in New York City to be in a thoroughly unhealthy condition," the statement declares. It goes on to say that this condition causes many otherwise avoidable accidents, and places the industry largely in the hands of irresponsibles unable to finance the liability for such accidents. Labor instability is also attributed to the present system of operation. Declaring that drastic changes in organization must be made to cure existing ills, the statement adds that the industry "must be encouraged in its inevitable transition to a full grown member of the public utility family."

The report is a voluminous document, including not only the commission's conclusions and recommendations, but also a mass of detailed evidence upon which they are based. These data cover exhaustive studies of conditions in all large American cities and the principal foreign municipalities where taxicab operation is an important transportation factor. This part of the report treats in detail such elements of the taxicab industry as general organization, accidents and safety, cruising and hack stands, rates of fare, the "purpose-built" cab, the cab industry as a public utility and the problem of cab transportation as part of a unified system.

Important Recommendations Made

Among the specific recommendations contained in the report are the following:

That the taxicab industry of New York City be declared to be a public utility and be placed under the jurisdiction of a taxicab control bureau in the Board of Transportation, with authority to assure proper control of the entire industry.

That operation of taxicabs on the streets of New York City be subject to the grant of a certificate of public convenience and necessity issued by the taxicab control bureau on the basis of conditions subsequently enumerated, with power of revocation.

That existing cab owners' licenses to operate cabs on the streets of New York City be granted such certificates covering the operation of cabs now operated, but terminable as to each such cab with its life, and not in any case for more than three years.

That where there is failure to operate any cab for any reason over a period of 60 days or, at the end of the three-year period, the certificate covering the operation of that cab shall lapse and shall be awarded as a new certificate only to the operation capable of demonstrating that public convenience and necessity require such additional cab and that it possesses the ability to utilize it economically and efficiently.

Requirements for Certificate

That the granting of new certificates be based upon demonstrated need for the number of cabs for which certificates are requested as well as upon the operator's establishing the following: ability to assume full financial responsibility for all liabilities incurred; ability to conduct an efficient and economical operation along good business lines; and the adoption of a color scheme or emblem, or both, not encroaching on the established good will of any operation.

That the taxicab control bureau given jurisdiction over the industry be given power to: grant and revoke certificates of public convenience and necessity as defined above; approve and revoke transfers of certificates of convenience and necessity; fix uniform rates and service standards, starting with the 15-5 rate; prescribe the submission of regular reports from all taxicab operations; require a uniform system of accounts to be kept by all taxicab operations; investigate accidents; establish specifications for taxicabs and their condition, including safety equipment, taximeters, etc.; prepare a program for hack stands and establish methods of operation which will eliminate unnecessary cruising; establish employee working conditions necessary to safe and efficient operation, and establish qualifications for drivers.

That the hack bureau of the Police Department shall be continued with its present organization and powers.

That certificates of convenience and necessity issued by the taxicab control bureau be assignable with the consent of such body, but that in no instance shall this body give its consent to such assignment where the consideration for the transfer is in excess of the price fixed by the regulatory body.

That a single rate of fare be established for all taxicabs operated in the city of New York and that for the present this be the prevailing rate of 15 cents for the first quarter-mile and 5 cents for each succeeding quarter-mile, with prevailing extras.

Present System Assailed

The commission's recommendations are based on an elaborate set of findings of fact, which, in turn, is summarized in a set of conclusions embodied in the report. The report declares that the taxicab industry here is, from a business standpoint, one of the most poorly operated industries of its size in the country, due mainly to excessive competition among the nearly 10,000 separate owners who operate its 19,500 cabs.

The conclusions describe as an outstanding evil the fact that there are 68,397 drivers for 19,507 cabs, with a resulting high labor turnover. This, the report asserts, undermines the safe and efficient conduct of the

industry. Excessive cruising is found to be a significant factor in the way of safe and economical operation.

On the basis of the facts brought out in its investigation, the commission finds the present prevailing rate to be adequate if 50 per cent paid mileage can be obtained. Placing of the industry on a business basis, with unnecessary costs to present disorganized conditions eliminated, would make possible lower operating costs, which could be shared with the public either in better service or further reductions in fare, the commission finds.

After describing the magnitude of the industry, with its 346,000,000 passengers a year and its annual income of $144,000,000, including tips to drivers, the commission comes to the conclusion that it must be recognized as "a full-fledged public utility" with proper organization and public control.

"The unifying of the city's taxicab service under a single franchised corporation," the commission finds, offers manifest advantages, many of which cannot be fully attained so long as diversity of operation remains. The advantages of unified operation in terms of economical utilization of cabs and reduction of traffic congestion are especially noteworthy.

"The possible advantages of co-ordinating taxicab operation with the city's general rapid-transit system should be further explored. In Philadelphia, Kansas City and Grand Rapids, such co-ordination has been adopted as a definite public policy, while the trend seems to be in that direction in Cincinnati. The theory is that the general transportation needs of a city can be most economically and satisfactorily met by the combined operations of all transit facilities, in which each supplements the other in resources and services."

L.C.C. Trams Get Low-Level Cars



One of the new tramcars just put in service by the London County Council Tramways

DOUBLE-TRUCK tramcars of a new type have recently been placed in service in South London by the London County Council Tramways. Of the 150 cars ordered, 100, designated as Class E-3, are equipped with two motors on maximum traction tracks for fairly level routes, and 50, of Class HR-2, have low-level four-motor trucks for use on hilly routes. The bodies of all are alike.

The cars are a development from the type tried experimentally last year. The general arrangement is shown in the illustrations. They are of the double-deck type, 33 ft. 10 in. over-all, and arranged for two-man operation. Each car seats 74 passengers, 28 on the lower deck and 46 on the upper deck. In the lower salon the upholstering is L.C.C. standard moquette, while on the upper deck a non-inflammable red leather substitute is used. On both decks, the floor is covered with battleship linoleum. The headlining is made of $\frac{3}{8}$-in. plywood. The side framing on the lower deck is of teak wood with interior finish of Honduras mahogany. On the upper deck the framing is made almost entirely of interchangeable die castings in Alpax metal, having high tensile strength. The outer panels for the roof covers consist of hard-rolled sheets of aluminum alloy in one width.

The outside paneling of the upper deck is of high



Wide windows and comfortable seats are features of the new cars. This illustration shows the lower deck



The upper decks of these new cars are totally inclosed and are fitted with upholstered seats

tensile aluminum alloy plate while the lower paneling is of mild steel plates, forming stiffening members for the car framing. The under-framing and main side posts are of pressed steel sections, electrically welded with supplementary rivets or bolts at points of severe strain.

Non-shatterable safety glass is used for windows and panels that are most liable to damage. Roller curtain destination signs are installed in the ends of the car.

For the 100 Class E-3 cars standard maximum traction trucks are used. The 50 Class HR-2 cars have swiveling trucks with wheels of equal size. All the journals are fitted with SKF roller bearings. The motors are also fitted with roller bearings of the same make. The wheels of the four-motor cars are 26½-in. diameter, mounted on 4½-in. axles. The truck wheelbase is 4 ft. 9 in., and the distance between truck centers is 11 ft. The minimum radius of curvature around which the cars will pass is the L.C.C. standard of 40 ft.

Each of the HR-2 cars carries four Metropolitan Vickers No. MV-109 motors, rated 30 hp. at 262½ volts, the pair of motors on one truck being connected in series. The E-3 cars have two English Electric DK-126-A motors, each rated 57.5 hp. at 525 volts.

The controllers of the class E-3 cars were built by the English Electric Company. They are of the two-motor series parallel cam-operated contactor type, with magnetic brake. The controllers of the HR-2 cars were manufactured by the Metropolitan Vickers Electrical Company. They differ from the others in being arranged for four motors.

Details of the equipment are given in the accompanying table.

Buenos Aires' New Subway

WORK on the first section of the new underground railway which will run from the Buenos Aires Central Railway station to the port at Callao is rapidly nearing completion. The first 4½-mile section was opened recently. The length when the line is completed will be 5½ miles. The subway, which is being built by the Buenos Aires Central Railroad & Terminal Company, is expected to carry 200,000 passengers a day with an estimated revenue of £300,000 a year. Delivery of the entire order of 56 cars for the system will soon be completed.

Specifications of the 150 New Cars for London County Council Tramways

E-3 UNITS

Number of E-3 units	100
Type of unit	Double-deck, two-man, motor, passenger, city, double end, double truck
Number of seats	74; 46 up—28 down
Builder of car body	Hunt Nelson & Co., Ltd., Motherwell, Eng.
Date of delivery	1930
Bolster centers	10 ft. 4½ in.
Length over all	33 ft. 10 in.
Length over body posts	22 ft. 2 in.
Truck wheelbase	4 ft. 6 in.
Width over all	7 ft. 1 in.
Height, rail to trolley base	15 ft. 7 in.
Body	Semi-steel
Roof	Arch
Doors	End
Brakes	Magnetic
Armature bearings	Roller
Axles	5 in. and 4 in.
Car signal system	Atmospheric air type
Control	English Electric Co. series-parallel
Destination signs	Illuminated curtain
Floor covering	Battleship linoleum
Gears and pinions	20 deg. involute
Glass	Non-shatterable in exposed parts
Headlining	⅜-in. Tucker plywood
Interior trim	Honduras mahogany below; light and antique oak above
Journal bearings	Roller
Journal boxes	SKF
Lamp fixtures	Silvalux, 10 in. lower, 10 in. upper deck
Magnetic brakes	Estler Bros., Ltd.
Motors	Two English Electric No. DK-126A, outside hung (57 5 hp.)
Painting scheme	Vermilion and cream
Roof material	Aluminum alloy sheets
Sash fixtures	"Windsor"
Seats	G.D. Peters & Co.
Seating material	Moquette below; leather cloth above
Steps	Stationary
Trucks	Electro-Mechanical Brake Co., Ltd.
Ventilators	4 Ashanco and Venturi air-extracting units
Wheels, type	Steel, diameter 31¼ in. and 21¼ in.
Wheelguards	Hurst, Nelson & Co., Ltd.

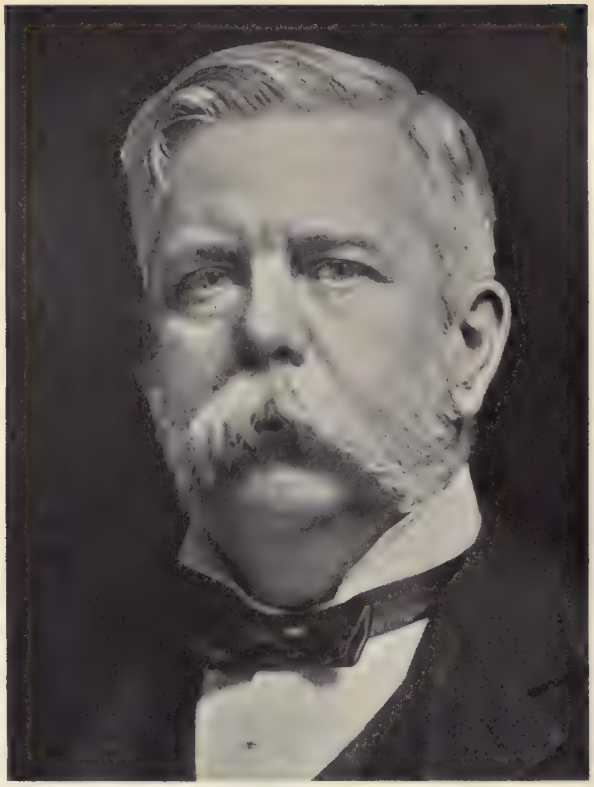
HR-2 UNITS

Number of HR-2 units	50
Type of unit	Double-deck, two-man, motor, passenger, city, double end, double truck
Number of seats	74; 46 up, 28 down
Builder of car body	English Electric Co., Ltd., Preston
Date of delivery	1930
Bolster centers	11 ft. 0 in.
Length over-all	33 ft. 10 in.
Length over body posts	22 ft. 2 in.
Truck wheelbase	4 ft. 9 in.
Width over-all	7 ft. 1 in.
Height, rail to trolley base	15 ft. 7 in.
Body	Semi-steel
Roof	Arch
Doors	End
Brakes	Magnetic
Armature bearings	Roller
Axles	4½ in.
Car signal system	Atmospheric air type
Control	Metropolitan-Vickers Co.
Destination signs	Illuminated curtain
Floor covering	Battleship linoleum
Gears and pinions	Helical
Glass	Non-shatterable in exposed parts
Headlining	⅜-in. Tucker plywood
Interior trim	Honduras mahogany below; light and antique oak above
Journal bearings	Roller
Journal boxes	SKF
Lamp fixtures	Silvalux 10 in lower, 10 in upper deck
Magnetic brakes	Estler Bros., Ltd.
Motors	Four Metropolitan-Vickers No. MV-109, inside hung (30 hp.) two in series on 525 volts
Painting scheme	Vermilion and cream
Roof material	Aluminum alloy sheets
Sash fixtures	"Windsor"
Seats	G. D. Peters & Co.
Seating material	Moquette below; leather cloth above
Steps	Stationary
Trucks	Electro-Mechanical Brake Co., Ltd.
Ventilators	4 Ashanco and Venturi air-extracting units
Wheels, type	Steel, diameter 26¼ in.
Wheelguards	Hurst, Nelson & Co., Ltd

Memorial to

George Westinghouse

Citizen, Inventor and Benefactor of Humanity



George Westinghouse

IN A WOODED GLEN in Schenley Park, Pittsburgh, and before a striking bronze group which is an outstanding contribution to modern art, leaders in every activity of American life paid their respects on Oct. 6 to the memory of one of its most brilliant empire builders—George Westinghouse, inventive genius who produced some of the greatest safety devices of modern times, helped to make the electrical age possible and about these accomplishments built industries which today employ more than 70,000 people in the United States, Canada, Europe and the Orient.

The memorial consists of seven great panels and a statue. It represents the finest efforts in present-day sculpture and architecture. Daniel Chester French, foremost among modern sculptors, contributed the best of skill and genius to produce the figure of American Youth and the main panel. Henry W. Hornbostel, designer of the Harding Memorial, the Hellgate Bridge, and many prominent public buildings, arranged the beautiful setting of the Memorial. Paul Fjelde, a rising young Italian sculptor, produced powerful, striking bronze records of Westinghouse's six greatest mechanical achievements.

At the dedication more than 800 men and women were grouped at the entrance to the ravine in which the memorial was erected. Before them, bordered on both sides by the broad green of two weeping willow trees, was a lily pool. Beyond it, against a background of rocks and the first color of the fall foliage, was the memorial. There is a large central panel flanked by two semicircular wings, all in gold-leafed bronze, with base and insets of black Norwegian granite. In a medallion on the central panel George Westinghouse leans over his drawing board. On either side stand life-size figures in full relief—a skilled mechanic and an engineer with his slide rule. Each of the flanking wings bears three panels depicting in low relief the major events in the career of Mr. Westinghouse. Then, before the monument, placed well back from the panels, stands a bold figure of American Youth, the work of Mr. French. Just a boy it is, in knickers and sweater, his schoolbooks under his arm, who gazes with eager, reverent interest upon this inspiring testimonial to creative genius.

The host of distinguished guests, leaders in the electrical and railway industries, the financial and business world, massed about the speakers' platform made a vivid scene. It was impressive because this throng had come together to honor not only a great man but the ideals and qualities of greatness which that man personified. Through the characteristics of his life and work, therefore, this shrine of George Westinghouse becomes "a monument to the dignity of labor and the supreme glory of service." It is a symbol of the faith, courage and spirit of man that have built the industrial empire.

Incidents in the story of the life of George Westinghouse were reviewed by eloquent speakers in the program of dedication and at the banquet of 700 guests of the Westinghouse organization which assembled at the William Penn Hotel in the evening.

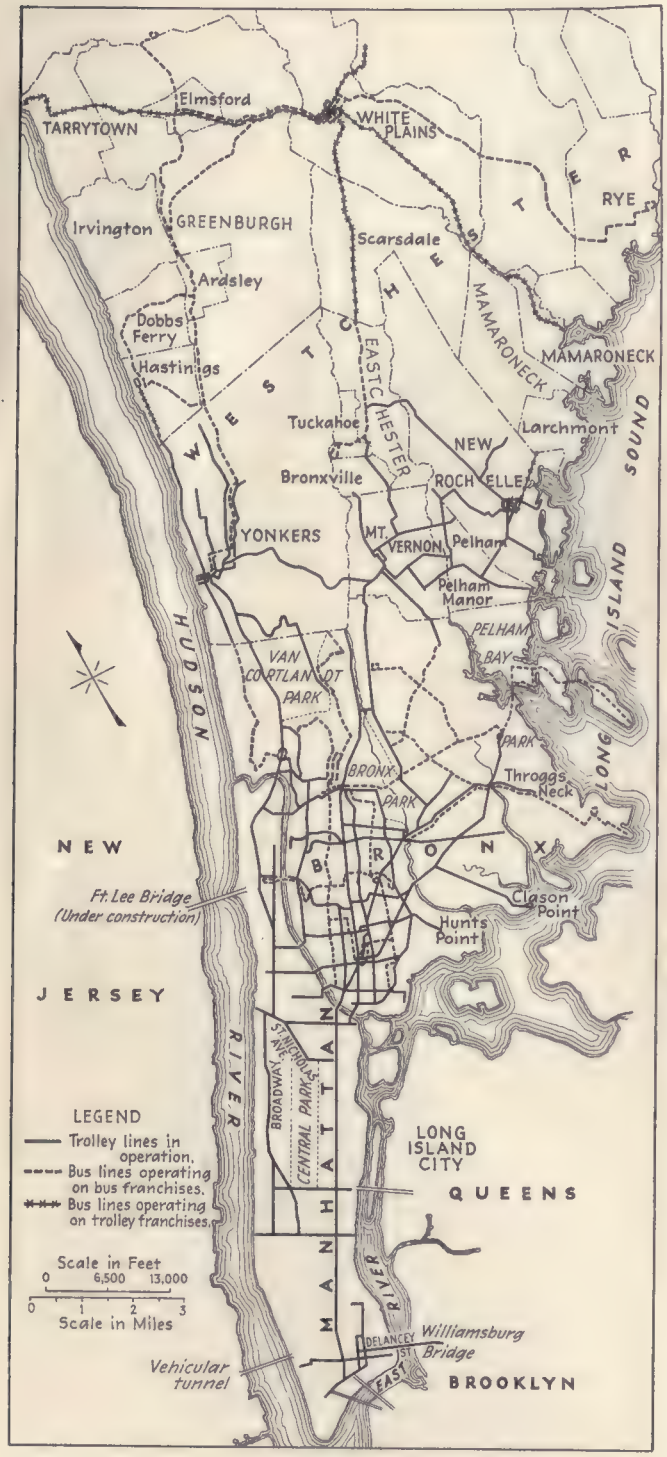
As one of the commentators of the unveiling said, it is impossible to measure George Westinghouse in terms that apply to ordinary men. He patented more than 400 inventions, but he was not primarily an inventor. He founded scores of successful companies, but he was in no sense a promoter. He made millions for himself and others, but he cared nothing for money for its own sake. He directed many vast engineering undertakings, but he cannot be considered merely an engineer. He was one of the most impressive figures, one of the most dynamic forces of his generation, and he applied his gifts and his ability for the benefit of humanity. He contributed greatly to the material development of his country and the world at large and, because of the universality of his work and genius, belongs not only to America, but to the world.

The memorial in Schenley Park is an expression of the pride and veneration of the many thousand Westinghouse employees who contributed to a fund to do honor to this great man. And the occasion in itself was a recognition and a tribute such as have seldom been given in the history of industrial progress.

Co-ordinated Bus Operation

INCREASES

Supplementary and feeder service in the Borough of the Bronx and partial replacement service in Westchester County have gained new riders. At the same time street car gross revenue has increased



Bus operations of the Third Avenue Railway System are divided into two distinct units. Twelve routes in the Bronx are effectively co-ordinated with street car service in that borough. In Westchester County general substitution of buses for cars has been made. Further expansion of bus operations in southern Westchester County is under consideration.



A 23-passenger bus used for shuttle service

INDICATIVE of the value of properly co-ordinated street car and bus services is the experience of the Third Avenue Railway System, New York City. In the Borough of the Bronx, this company through its subsidiary, the Surface Transportation Corporation, in operating twelve extension and feeder bus routes covering approximately 60 miles. In Westchester County, the system includes two local and seven interurban routes, ranging in one-way mileage from 1.34 to 12, the total being slightly more than 58 miles. In this latter group five lines have replaced previous street car operations. Notwithstanding the fact that the bus systems have been installed in territories already well served by the street car lines of the Third Avenue Railway and the fact that receipts from bus operations now amount to approximately $6,000 a day, gross revenue from street car operations in both the Bronx and Westchester County have shown substantial increases.

For the system as a whole, due to traffic losses in Manhattan, the street car revenue for the year ending June 30, 1930, was 3.3 per cent below the preceding year.

REVENUES *of Third Avenue Railway*

in New York City



Double-deck buses seating 56 passengers are used on the two Concourse routes

Bus revenue for the system as a whole increased 11.2 per cent. The increase in net revenue from bus operations more than offset the decrease in net from rail operations.

Franchises covering the twelve routes in the Bronx were obtained from the City of New York under date of Aug. 4, 1927. The term of the original grant is for five years, with the right to renew for an additional five years resting with the company. The basis on which the franchises were secured was the 5-cent fare, although two routes were permitted two zones of 5 cents each, and two more routes were permitted three zones of 5 cents each. Two lines were put into operation during the latter part of 1927 and the system was completed during the following year. With these services in effect in the Bronx, the threatened invasion of the Third Avenue Railway Company's territory by independent bus operations disappeared.

Previous to 1927 the bus operations of the Third Avenue Railway were confined to scattered lines in Westchester County. Here again, independent bus operations threatened local and interurban street car lines. Therefore, under its subsidiaries operating in this territory, the company turned its efforts to the securing of a unified and co-ordinated bus system which would adequately serve the twenty municipalities in this area and protect the investment previously made.

After a long process of education both of the company and the communities served, fair and reasonable conditions of operation were obtained. Franchise agreements with these various municipalities and the agreements for the substitution of buses, where desirable, have now been concluded. For the most part, buses in Westchester County are operating on street car franchises by consent to substitute buses for cars. The street car franchises have in most cases about 70 years



A Versare gas-electric bus in service in the Bronx system



Safeway, six-wheel vehicle used by the Third Avenue Railway System

Statistics on Third Avenue Railway Bus Operations

Route No.	System Companies	One-Way Mileage	No. Buses		Type of Bus	Headway		Speed M.P.H.	Stops per Mile	No. Zones	Fare per Zone, Cents	Year Started	Replaced Trolley	Pass. Carried Month July, 1930	
			Mid-day	Rush		Mid-day	Rush							Fare	Trans.
	Surface Transportation Corporation														
1	Concourse—138th Street	5.01	8	12	56 pass., d'ble deck	10	5-6	7.57	10	2	5	1928	No	486,380	19,616
2	Concourse—Hub	6.12	8	10	56 pass., d'ble deck	10	8	7.72	10	2	5	1928	No	353,367	24,944
3	Prospect Avenue	5.85	12	16	37 pass., gas-elec.	6-7	5	7.40	10	....	5	1928	No	466,246	40,611
4	Jerome Bainbridge	4.10	8	16	29 pass.	7-8	3-4	7.94	8	....	5	1928	No	376,815	12,149
5	City Island—West Farms	8.00	4	4	29 pass.	20	20	10.17	8	3	5	1928	No	214,572	6,256
6	Throggs Neck	4.80	6	14	29 pass.	8	3-2	9.09	8	....	5	1928	No	327,692	4,271
7	Boston Road	2.60	1	1	23 pass.	30	30	9.85	8	....	5	1928	No	19,861	730
8	Williamsbridge Road	2.60	1	1	23 pass.	30	30	9.63	7	....	5	1927	No	19,071	4,217
9	Eastchester Road	3.70	2	4	23 pass.	25	18	9.68	7	....	5	1927	No	82,873	11,842
10	Riverdale Avenue	3.55	2	4	23 pass.	20	10	9.35	7	....	5	1928	No	71,130	0
11	170th Street Crosstown	3.50	8	12	37 pass., gas elec.	8	5-6	6.40	10	....	5	1928	No	458,512	49,216
12	City Island—Fordham	8.35	5	10	29 pass.	10	7-8	9.39	8	3	5	1928	No	355,241	27,003
	North Street Transportation Corporation														
17	White Plains-Yonkers	12.00	2	2	29 pass.	60	60	11.59	3	8	10	1925	No	22,208	0
18	White Plains-Harrison-Rye Beach	8.50	2	2	29 or 41 pass.	60	60	9.16	3	4	10	1925	No	29,991	0
	Westchester Motor Transfer Co. Inc.														
29	White Plains-Hastings	10.50	3	4	29 pass.	60-20	60-10	11.46	6	5	10	1927	No	26,521	600
30	White Plains-Grasslands	6.00	1	1	29 pass.	60	60	12.32	6	3	10	1927	No	16,621	0
	Westchester Street Transportation Co., Inc. and Eastchester Transportation Corp.														
22	White Plains-Tuckahoe	7.52	4	8	29 pass.	20	10	9.81	6	3	10, 15, 25	1926	Yes	79,525	0
21	White Plains-Mamaroneck	4.10	3	3	29 pass.	20	20	12.27	5	3	10, 15, 25	1927	Yes	28,033	0
23	Silver Lake	1.85	1	2	29 pass.	30	30	7.08	10	1	10	1927	Yes	25,321	0
25	White Plains-Tarrytown	6.40	4	6	41 pass.	20	10	9.17	10	4	10, 15, 20 25	1929	Yes	87,052	0
	Hastings Railway Company														
	Warburton Avenue	1.34	2	2	29 pass.	10	10	8.02	4	1	10	1929	Yes	24,207	0

to run. The consent for the substitution of buses provides for a minimum fare of 10 cents, with the right to reinstall tracks and car operations after ten years if such reinstallation seems desirable. This factor of the franchises is believed to warrant the sacrifices and expenditures necessary to develop a more extensive system. In fact, further substitution of buses for cars is under consideration in the southern part of Westchester County, in Mount Vernon, New Rochelle and the Pelhams.

On all lines the Third Avenue Railway System operates 177 buses, of which 133 are used in the Bronx and 44 in Westchester. New vehicles, consisting of Safeway six-wheel, A.C.F. and Versare gas-electric buses, were purchased for use on these systems, ranging in seating capacity from 56 to 23 passengers. On the two Concourse routes in the Bronx, 27 double-deck buses are used. In Westchester, six 41-passenger vehicles are operated on the White Plains-Tarrytown route, the remainder seating 29 passengers. The smaller, 23-passenger, buses are used generally in shuttle service in the Bronx. When these buses were purchased, the company financed 80 per cent of the cost with 5 per cent equipment certificates sold at par, which are being retired serially over a period of five years.

Garage facilities are centrally located for both the Bronx and Westchester systems. It was necessary to purchase land and construct a garage in White Plains for Westchester County. It is located within two blocks of Main Street, and on the Harlem division of the New York Central Railroad, with a siding on the property from which oil and gasoline can be delivered in tank car lots. In the Bronx, the company secured a central location, owned by a contractor, who built a modern garage to meet the railway's requirements on rental terms, which were very advantageous, as well as saving the outlay of a large amount of money. A building belonging to the Union Railway, a subsidiary, located on West Farms Road and 172nd Street, formerly a power plant, was reconstructed so as to make it particularly well adapted to the purposes of a general shop for the rebuilding of buses. Subsequent additions to this building house a machine shop, paint shop and storeroom. Buses from both systems are brought to this plant for general overhaul and repair.

Equipment Inspections and Overhaul

Maintenance practices include three schedule inspections and an overhaul. All are on a mileage basis as follows: At a minimum of 1,000 miles, buses are held in on a greasing inspection; at 2,000 miles the bus is given a general inspection, and at 20,000 miles a general engine inspection is made. At the end of approximately 1,000 miles buses are thoroughly inspected for grease, and lubricating materials are renewed. Heavy greases are used only in universal joints and wheel bearings. A 600-W type lubricant is used in the rear end and transmission, as well as in the grease cups. At the general, or 2,000-mile, inspection the body, engine, electrical equipment, treadle doors, seats and floors are thoroughly inspected. At the 20,000, or engine, inspection oil pans and cylinder heads are pulled, main and connecting rod bearings, pistons, rings and cylinder walls are checked and replacements are made if necessary. The general overhaul or repair is based on the condition of the bus at the various inspection periods. This averages approximately every 50,000 miles.

Bus operation and bus maintenance supervision are combined under one executive of the Third Avenue Railway System. A general superintendent heads both departments. This practice has been especially successful in co-ordinating operating and maintenance practices as well as instruction and discipline in both phases. Road supervisors and inspectors are schooled in both operating and maintenance methods and they, therefore, watch the effect of individual operation on the mechanical equipment. An example of the effect of this co-ordination is reflected in the greater tire mileages obtained over a short period. They have been increased from 12,000 to 19,000 miles. If an operator of a bus has abused equipment during his run, he is brought before a trial board consisting of the general superintendent, operating and maintenance officials, and given either instruction or discipline for his violation.



Curve construction for trolley bus showing one method of support

Successful Trolley Bus Operation Demands Suitable Overhead

The writer discusses the requirements of the service, which differ materially from street car work. The principles on which design of contact line and collectors is based are discussed

By

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General Electric Company, Erie, Pa.

VARIOUS types of overhead contact and collector systems have been tried in the many years trolley buses have been in use. Probably the three systems that have been employed most widely are the over-running contact, the sliding contact, and the trolley-wheel.

With the over-running contact system the two contact wires, positive and negative, are so insulated and supported that a small carriage with grooved wheel can be towed along over the wires by a flexible cable which completes the electrical circuit between the trolley bus and the contact wire. This system has been used abroad to a limited extent, but in this country only for trial runs which were not successful.

Its chief advantage is that the touring range of the bus is limited only by the length of flexible cable that can be handled properly, and not by a pole of fixed length. Another supposed advantage is that two trolley buses can pass each other by an exchange of collectors.

Its disadvantages are the expense of constructing and maintaining a suitable overhead line and a collector carriage and the complication where routes cross each other or branch off. Also, it is unsuitable to combine with overhead systems used by a street railway.

In the sliding contact system, positive and negative contact wires are so insulated and supported that a collector consisting of two long shoes with horns, both flexibly mounted on a single pole supported by a trolley base, can slide beneath the wires. The collector is very simple and has no rotating parts, and the contact wires can be placed close enough together to be supported and insulated by a combined unit.

A disadvantage of this system is that complicated, special devices must be used in the overhead line where routes cross or branch off. The system does not readily lend itself to joint usage with existing street car systems.

The trolley wheel contact system has two contact wires and two separate trolley bases and poles, fitted with insulated swivel pole heads. The arrangement lends itself to joint usage with existing street railway overhead lines better than either of the previous types. Also much existing street railway standard line material may be used. Accordingly this system has, in this country, superseded all others.

Special Trolley Wheel Collectors Employed

The limitations of the wheel collector should be known so that a large amount of standard street railway line material may be used. This, if properly installed, will prove very successful. There is nothing in the design of the collector that has not been used before, especially on street railways abroad where the trolley wire is located

alongside the right-of-way. The main changes are lengthening of the pole, adopting efficient bearings, and selecting operating angles to meet detouring requirements.

The latest installations use collectors with an 18-ft. pole. The base and pole head are so designed that the wheel will operate normally between the limits of 7 and 10 ft. above the bottom of the base. The limit of detouring range from under the contact wire within the above limits of height, on tangent overhead at normal speed should not exceed 10 to 12 ft. It is advisable to reduce speed when detouring to any great extent from under the contact wire on curves or under special overhead fittings.

The most recent collector bases and pole heads have roller bearings so as to respond readily to all the variations in the overhead system and the movements of the



Branch-off for trolley bus service. Insulators keep the two lines separate

bus on the street, and thereby keep a uniform wheel pressure against the wires. However, with the necessary weight of the 18-ft. pole and swivel pole head, this cannot be done if abrupt changes occur in the overhead system. Alignment of contact wire is, then, very important.

The pole head design is such that a line passing through the axis of the swivel bearing intersects at right angles the center line of the wheel bearing. The angle between the axis of the swivel bearing in the pole head and the center line of the pole is fixed, so there is only one position of the pole at which the axis of the swivel bearing will be perpendicular to the center line of the contact wire. This may be called the design position of the pole. If the pole is higher than the design position when the bus is directly under the contact wire, the swivel bearing gives the harp a slight leading caster effect, which is unstable. If the pole is lower than the design position when the bus is directly under the overhead, the swivel bearing gives the harp a slight trailing caster effect, which favors stability of the harp. If the bus diverges from under the overhead and the pole is above the design position, the harp and wheel are tipped in the direction to hook around the contact wire, which tends to prevent dewirements. If, however, the pole is below the design position and the bus diverges, the harp and wheel are tipped, tending to unhook the wheel groove from the contact wire.

Contact-wire height is very important in connection with the operation of a swivel-head collector. At points where the bus is likely to detour from under the contact wire, such as at designated curb stops, the wire height should be such as to maintain the pole at the middle point of its operating range. Care should also be taken in building and maintaining the overhead system to have the sides of the contact wire ears and splicing sleeves as nearly vertical as practicable to minimize the liability of the wheel flange fouling with the ear boss when the bus is detouring and the trolley wheel happens to be tilted.

The collector pole head was designed to permit the wheel to follow the varying positions of the contact wire with the least possible resistance and to give a certain amount of stability in backing. The only means by which the necessary force is obtained for moving the pole head under the wire is through the trolley pole, which is never in direct alignment but is always pulling the wheel along at some angle to its direction of travel. When the trolley bus detours from under the contact wire, the wheel and pole head must travel faster than the bus because of the increasing angularity between the pole and the contact wires. This calls for an additional force on the side of the wheel. It is, therefore, essential to reduce as far as possible the horizontal angularity of the pole to the contact wire, which becomes maximum because of side displacement of the wire when the collector approaches a support. This side displacement, which is caused by the side pull of the collector, will be reduced if a high tension is maintained in the contact wires.

The swivel-type harp is at certain speeds subject to "shimmying" as are the front wheels of an automobile when out of adjustment. Just as a rough road aggravates the shimmying of automobile wheels, a rough overhead may start the trolley wheel shimmying. With round wire, care should be used when installing the ears to see that they are well formed around the wire and also that the splicing sleeves are installed with their sides vertical so as not to aggrevate this tendency when the wheel passes such obstructions.

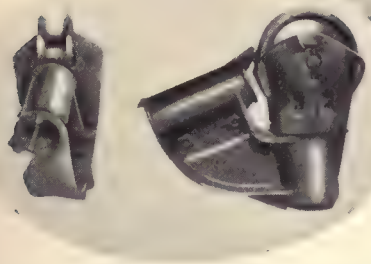
Both Single and Double Lines Used

In general, the overhead construction for trolley buses may be classified as a single line or a double line. A single line has two wires, positive and negative, corresponding to a single track street railway. Buses may or may not operate in both directions under it. A double line has four wires, corresponding to a double-track street railway.

Some portion or all of either the single or double lines may make joint use of the positive trolley wire of an existing street railway. When trolley buses and street cars make joint use of the same positive contact wire, such use prevents the detouring of the bus around a street car without the removal of the street car collector. The location of the street car overhead positive wire may be such that the bus touring radius is not sufficient to reach the curb. It also may be undesirable to make joint use of the street car overhead positive trolley wire on account of complications involved in the overhead construction, as sometimes a large number of special fittings are required. For a successful solution of each case a detailed study must be given to the various problems involved.

In erecting an overhead contact system for trolley-bus operation the methods used are the same as for direct suspension construction for street railways, with contact

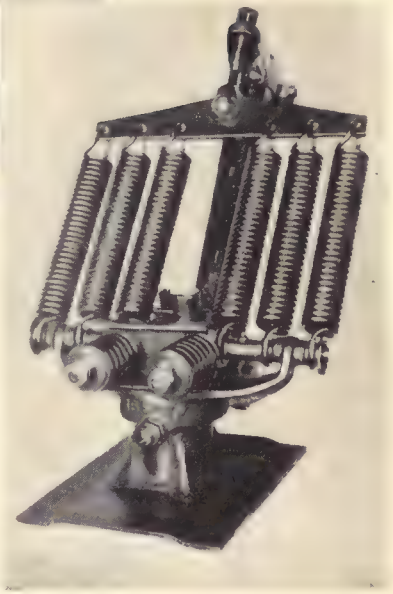
One type of swiveling harp and wheel for trolley bus use





In this double line crossing one set of wires is carried through and the other set is broken at the intersection

Swiveling trolley bases of this type are widely used on trolley buses



wires suspended at spans or brackets only. The pole spacing should not exceed 100 ft. and preferably should be less where special overhead fittings occur.

With cross span construction a second cross span across the street from pole to pole may be necessary to keep the contact wires supporting ears in a vertical position, if the cross span wire is heavily loaded with other wires and special overhead devices. The upper span is then given all the sag and carries the complete load. The lower cross span is largely used for holding the suspensions and special devices in proper position.

Contact Wire Location Depends on Service

If the service demands only a single line with bus traffic in both directions, the contact wires should be placed over the middle of the street. If the street is wider than 30 ft. it will be necessary, with the present design of collector, to displace the contact wires to the side of the street at points where scheduled curb stops are to be made.

So that the bus operator need not remove his collector from the contact wires when passing another bus moving in the opposite direction at scheduled meeting points, overhead turnouts may be installed. Since the collectors are the only parts that take the turnout, its length may be much shorter than for street car track turnouts. For a trolley bus overhead turnout, special frogs and crossings are required. The frogs should be of the one-way operating type so that a bus moving in either direction will always keep its respective contact wires at passing points.

If the service demands double overhead the center line of each pair of wires should be approximately 12 ft. from the curb line. When the contact wires are so located, the bus can pass parked vehicles at the curb and also can make curb stops without going beyond the operating range.

For either single or double overhead, a loop for turning the buses is desirable, although they may be turned on a wye in the overhead system where space will not permit construction of a loop. The wye requires special frogs and crossings, which call for more maintenance than standard fittings used on loops. Where wyes are used, the trolley wires should be installed at normal height and good tension maintained.

When positive and negative feeders are required, it is best for safety reasons to keep the negative feeder on the opposite pole line from the positive. The negative feeder is always insulated the same as the positive. Taps from the feeder to the contact wires should be carried by a cross span located above the supporting span, with the taps dropped down to the feeder ears attached to the contact wires. A feeder ear with a suspension boss should be used. It is best for insulation and for safety to make the negative and positive feeder taps at adjacent spans rather than at the same span.

Generally speaking, the principles used for sectionalizing street railway lines apply to trolley bus lines. It may be desirable to install section insulators, normally shunted, in the negative trolley wire, permitting disconnection of the negative wire for the safety of linemen in working on certain sections.

Practically all existing trolley bus installations in this country make use of standard street railway suspensions with either a porcelain or wood strain insulator between the positive and negative contact wires. Since the trolley bus collector consists of two separate units which for mechanical and electrical clearance require approximately 24 in. between centers, the contact wires are spaced the same distance on tangents and in some instances slightly greater on curves. Later installations use the same spacing for both tangent and curves.

The nominal spacing of 24 in. for the trolley wires is too great for an economical combined unit with two insulated suspensions and double insulation. The practice of installing a strain insulator in the span between the insulated hangers no doubt had its origin in a similar practice of reinforcing suspension insulation on regular street railway work. It seems quite probable that on new work satisfactory insulation between positive and negative can be obtained at a lower cost by using a better quality of insulation than is regularly used in street railway suspensions. On account of the possibility, however, of the cross span wire becoming energized because of a dewired wheel, a strain insulator should be placed in the cross span next to the pole.

On curved sections straight-line suspensions should be avoided when tilting of the ears cannot be prevented. The number of curve suspensions should be such that at no pull-off point will the deflection angle be more than 12 deg. All contact wire ears should be formed at such points to correspond to the arc of the curve. No curve in the overhead should have a smaller radius than the turning radius of the bus.

On account of the angularity which a swivel harp gives the wheel when proper trolley wire heights are not maintained, it is very important that all devices in the overhead system give the maximum wheel clearance possible. Existing trolley bus overhead systems as a rule use round wire and clinch ears of various lengths. Of late years, in order to obtain long life, the lip thickness has been increased. Special care should be taken when installing them to peen the lips close to the wire. Grooved contact wire with clinch ears gives far better clearance and eliminates many of the ear troubles experienced with round wire. It should be given consideration.

In selecting splicing sleeves for trolley-bus service, wheel clearance is the most essential point. It is best to use a sleeve with a small height so as to reduce the turning tendency as much as possible.

Special Frogs Are Required

Since the wheel of a trolley bus collector is free to turn about its swivel bearing, it must at all times be guided in the direction in which it should travel. For this reason standard street railway contact wire frogs should be used only when the travel is from the double end to the single end. In order for the wheel to pass through a frog in the other direction, the path for the wheel tread must be continuous. This is accomplished by having frogs with a movable tongue for the tread of the wheel to follow, of which there are three types, operated by spring, mechanically, and electro-magnetically.

The spring type frog is similar to any standard street railway overhead frog except that it has a tongue which completes the path for the trolley wheel tread from one end to the other. This is so hinged that, when a wheel passes on the runway not connected with the movable tongue, its flange may crowd the tongue to the side and allow the wheel to pass through. When a wheel passes in the opposite direction, it always follows the runways connected with the movable tongue. In earlier designs the movable tongue consisted of a flat spring, but as it deteriorated rapidly later designs have a hinged tongue held in position by a coil spring.

The spring frog is used where the bus operator need not select the route, as at the junction point of a loop and a single line overhead system, junction points in a wye and on single-line turnouts.

The mechanical type frog has a movable tongue connected by an insulated rod to a treadle in the other trolley wire. When the trolley wheel passes the treadle, it operates the movable tongue in the frog for guiding the wheel passing through it in the same direction as the trolley wire with the treadle. The mechanical frog is used only where the trolley bus overhead branches off from a street car system.

The electro-magnetic frog has two solenoids to move the tongue. For its operation special devices must be installed in the overhead adjacent to the frogs that will under certain conditions allow current to pass through the proper solenoid to move the tongue. The electro-magnetic frog is used where route selection to be made by the bus operator, as where lines branch off.

Pennsylvania Railroa

First unit in expansion program placed in service is suburban terminal in heart of the city and a connecting underground line

RAPID progress is being made in the reconstruction of the Pennsylvania Railroad's tracks and terminals in Philadelphia, which forms an integral part of the major electrification project which is being carried out by the railroad. The principal changes in the Philadelphia district are centered in the construction of a new passenger station for through and suburban trains at 30th and Arch Streets, a new underground suburban terminal at Sixteenth Street and Pennsylvania Boulevard (formerly Filbert Street), and the abandonment of the steam terminal at Broad and Market Streets and the West Philadelphia station at 32nd and Market Streets.

Progress in the work is being watched with interest, since it involves maintaining a very heavy train service through the territory while the new construction is going on. The transfer of train service from the old to the new facilities is being carried out in a series of steps planned to produce as little interference as possible. It is expected that the improvements will be in full use late in 1933.

The first unit in the plan, the suburban terminal, the connecting tracks and the portion of the 30th Street station reserved for suburban trains, was put in service on Sept. 28. Temporarily, a few suburban train movements are being made into the old Broad Street station, and steam trains terminating in Philadelphia are being operated to and from there. Ultimately, all of the 325 daily suburban electric trains will use the new stations. As soon as the construction of the through terminal at 30th Street has progressed far enough, movements to the old Broad Street Station will cease and the viaduct adjacent to Market Street will be torn down. The land will be used in part for widening Pennsylvania Boulevard and in part for construction of office buildings facing on Market Street.

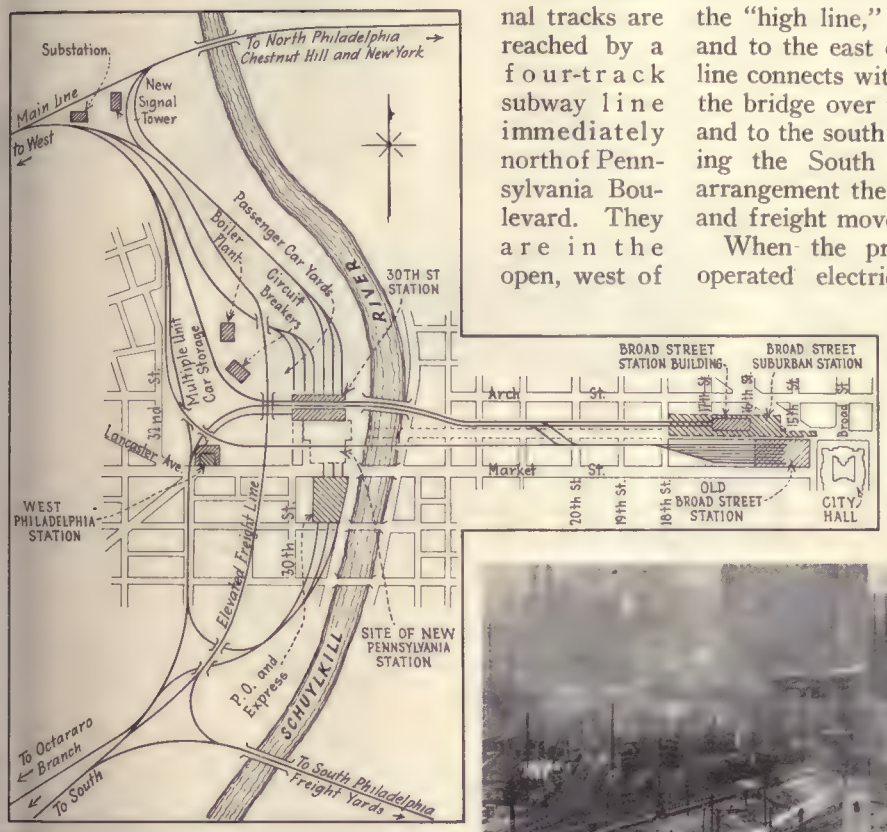
The main terminal station at 30th Street will have two track levels, the lower one for through trains hauled by locomotives and the upper one for suburban trains of multiple-unit cars, with a passenger concourse on the level between the two. The sixteen tracks for the through trains on the lower level will run north and south, in general paralleling the Schuylkill River. Facilities will be provided so that through trains between New York and the West can enter and leave the station by means of loop tracks without reversing direction. Trains between New York and Washington will pass directly through the station. The six suburban tracks run east and west above the passenger concourse at the north end of the station. The arrangement will provide for transfer of passengers between the through trains and the suburban trains reaching the heart of Philadelphia.

The Broad Street suburban terminal occupies a position immediately to the north and west of the present Broad Street station. It is 1,000 ft. long and 200 ft. wide. The passenger concourse is beneath the ground level, being reached by convenient stairways and passage-

pens New Facilities in Philadelphia

ways connecting with the adjacent streets, the Broad Street station, the Broad Street subway station and the new Broad Street Station Building, which has been erected above the suburban terminal at the northwest corner of Sixteenth Street and Pennsylvania Boulevard, extending westward to Seventeenth Street. The tracks are immediately beneath the passenger concourse. At present, seven have been installed, and the number will be increased to twelve as the project develops.

The terminal tracks are reached by a four-track subway line immediately north of Pennsylvania Boulevard. They are in the open, west of



The principal improvements of the Pennsylvania Railroad electrification centering in Philadelphia include new through and suburban stations and removal of the masonry viaduct adjacent to Market Street

Twentieth Street, and, after climbing a grade, cross the Schuylkill River on a masonry bridge, immediately west of which is the 30th Street station.

A temporary connection has been made in the vicinity of 21st Street so that through trains can be operated over the new line into the Broad Street station. This will permit the present line between that point and the West Philadelphia station to be abandoned, so that construction of the lower level and the station building at 30th Street can be carried out. There will be sixteen tracks on the ground level when the project is completed, and the station building will extend south to Market Street. Immediately south of the station will be a new building for handling mail and express. To the north of the suburban line and west of the through tracks there will be a storage yard for passenger cars. This construction is now in progress. Storage space for multiple-unit suburban cars will be to the west near the present line between New York and the south.

All track connections are made through a system of elevated and depressed tracks, so that there are no grade crossings. This facilitates train movements and eliminates interlocking plants.

Freight movements through the district will continue to be made over an elevated structure, known locally as the "high line," located to the west of the new station and to the east of the West Philadelphia station. This line connects with the main line tracks in the vicinity of the bridge over the Schuylkill River in Fairmount Park and to the south near the connection with the line reaching the South Philadelphia freight yards. By this arrangement there is no interference between passenger and freight movements in the entire terminal area.

When the project is completed all trains will be operated electrically from the single-phase, 25-cycle trolley at a normal potential of 11,000 volts. Power for the electrification is received from the Philadelphia Electric Company at the Lamokin Street substation, Chester, and distributed at 132,000 volts, except for the terminal area and the line to Paoli, which are supplied by the older part of the system at 44,000 volts. Stepdown transformer stations, unattended and operated usually from adjacent signal towers, are located 5 to 10 miles apart. The trolley feeders in the vicinity of the new 30th Street station are controlled by high-speed, air-break circuit breakers located on a steel structure adjacent to the station. Alongside it is a boiler plant for supplying steam for heating the station and cars stored in the yard.



An airplane view of the new 30th Street suburban station and the Schuylkill River bridge. The elevated freight line is seen in the background



Many lax and inefficient methods of operation have been handed down by old men acting as instructors for recruits

Observations on Methods of

Training Platform Men

By a

Veteran Electric Railway Official

Years of experience have proved that expert follow-up instruction of trainmen in the routine operation of their cars will result in worth-while economies. Co-operative remuneration based on savings in accidents and power costs encourages trainmen to improve their performance

IF YOU were to ask your superintendent of transportation who were the best operators your company had, he would almost certainly name those having the least number of accidents charged against their records. That would have been the way our superintendent would have answered you up to the time we began to look for economies in operation other than those shown in the amount spent on accident claims. These men were so classed because they were "very careful men." They were careful because they never took a chance, and as a result had excellent accident records. However, upon looking into other features of operation which were responsible for a large expenditure of money, it was found that these careful men were usually expensive operators in other ways involving the proper handling of the electrical apparatus on the car.

These men were often used as instructors for new recruits, with the result that many lax and inefficient methods of handling a car controller have been handed down from one man to another since the beginning of electric transportation. It is my belief that, although many companies have schools of instruction for beginners with large rooms filled with elaborate displays of various devices used on the cars, as well as diagrams of wiring, etc., the new recruit, whether having had this instruction or not, receives his strongest impression from observing how the man on the front platform performs his duty. I wish to emphasize the fact that better results will be obtained from practical instruction on the front platform in every-day service than from any other method now in use, provided the instructor is an expert in up-to-date operating ideas.

If worth-while economies of operation are to be effected, the first step to be taken must be the adoption of some plan to arouse the interest of the operators in their duties. If you are successful in interesting your men and holding them to their work with little effort, it will

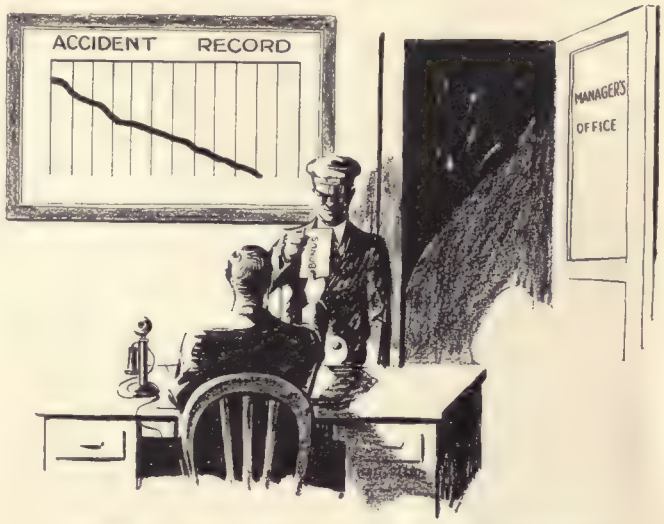
mean not only an improved quality of service, but will result in economies such as lower power consumption, lower maintenance costs of equipment and in a considerable reduction in claims for accidents. It is my belief that the means for arousing interest should not only be practical of application but profitable to the men as well as to the company. Bonuses based on attention to duty, efficient operation and safety have solved the problem on our property, and I feel sure can do so on many others.

Bonus Plan Arouses Interest In Accident Prevention

Payment of an accident bonus was one of the first steps we took in our program of the co-operative method of remuneration for platform men. About ten years ago we made an exhaustive survey of our claim department in endeavoring to reduce the number of accidents, which were entirely too numerous and costly. We found the department was doing everything possible in a legal, as well as persuave, manner to cut the cost of all claims. Officials were talking to the men from time to time in meetings. We had called upon the safety director of the city to assist by explaining what his department was doing to teach pupils in schools as well as the general public to practice safety at all times. This helped some, but it did not always last long. We had a safety banner which was held by the carhouse having the least number of accidents for a certain period, and this honor was keenly contested for throughout the property. We had an honor roll of men who had been free from accidents for a year, and at a banquet, held at the club room, a bronze medal was presented to each member of the roll by the general manager. All of the various schemes tried helped for a time and we spent a lot of money in an effort to cut out this cancerous growth which seemed to live upon that part of our resources intended for dividends. The money spent did not buy any shoes for the operators' children nor materially reduce the number of accidents.

Taking an average of the money paid out in claims for the previous five years, together with the money spent in putting on the foregoing safety campaign, we found it amounted to approximately $7,000 per year. This money all went outside of our organization to the benefit of people in whom we had no interest whatever. It occurred to me that it might be worth while to figure out some manner in which this money could be used to better advantage to the company than in the payment of claims. It was decided to offer the operators of our cars, all of which were one-man, 50 per cent of all money saved by the elimination of accidents. This would be paid in the form of a bonus of $30 for each man having not only a clean record on accidents for which he might be responsible, but from other violations of any nature such as failure to show up for his runs, discourtesy, missing fares and the like.

Payment of this bonus was to be made just prior to the Christmas season, and when the announcement putting it in force was made, great stress was made of the benefits to be derived from the receipt of this additional money at such an auspicious time. The men were enthusiastic over the proposition about like everything else we had tried in the past, so we were not at all alarmed over the fact that this bonus might amount to more than 50 per cent of all money saved by the elimination of accidents. But unlooked for results were obtained at once. This bonus has now been in operation for more than ten years, with the result that accidents of all kinds for which our men might be responsible have been eliminated to such an extent that the amount paid out in claims, together with the bonus, does not amount to



It is a good plan to divide with the operators the savings resulting from reduction in the number of accidents

any more than one-half the amount previously paid out for claims alone, and most of it goes to the operatives, where it belongs.

Another bonus was decided on to straighten out the kinks in our employment department. Any operator having a clear record for 30 days, no accidents or violations of any nature, was entitled to one day off the following month, with pay allowed. The day was to be of his own choosing and subject to such arrangements as the supervisor could make for a substitute to take his place. As a result of this bonus, minor violations passed into the discard to such an extent that we reduced our extra list to the absolute minimum. A large number of our men have been receiving not only a yearly bonus but each monthly one, which figures to approximately $90 per year for prize money, well spent and gratefully received.

As I have stated, to be efficient, an operator must not only be able to cut down losses from preventable accidents but those resulting from the excessive and wasteful use of power by improperly operating all electrical appliances installed on the modern electric car. Training to this end must begin with the recruit. Regardless of any school instruction, a new trainman must learn his operating practices and form his habits on the platform of a car under the guidance of someone with experience. I am a firm believer in expert platform instruction by competent men who do nothing else but supervise the actions and duties of the operators. These supervisors must not only be able to give them the theory of proper control of the car, but must be able to show the better way by demonstration under actual conditions. When I mention the proper handling of the controller I am referring not only to the speed with which the operator notches it, but to the fact that he too often runs on resistance points or throws the controller on and off too frequently, not being able to judge conditions and speed, and keeps power on for too long a time when approaching a stop, eliminating the amount of coasting to be obtained in any length of run with a resultant saving in power. Mechanical and electrical devices have been perfected to control the acceleration of motors, and

some companies have adopted these rather than find a way to assure proper performance by the man in charge of the car, but I prefer to have our men in entire charge of this feature and hold them absolutely responsible for the proper use of not only the controller but the brake valve as well.

Efforts To Save Power Should Include Auxiliary Uses As Well As Motors

The use of power-saving meters was advocated a number of years ago to register the amount of current passing through the motors. They were used in an effort to cut down the amount of power consumed and to enable the mechanical department to inspect or overhaul equipment on a specified kilowatt-hour basis. The use of these meters is an excellent method of checking current consumption of motors, but that is only a part of the total amount consumed by the apparatus on a street car. When one considers the amount of work it is necessary for the air compressors to perform with the addition of air-operated door mechanism to the previously installed braking apparatus, it is time to give the matter considerable thought. In my opinion, the meter should be so connected that it will include the compressor and the lighting circuits as well as the motors, because there is a great waste of current in these two circuits in proportion to the waste in the motor circuit. If you want to economize, why not get all there is to save instead of only a portion? This would not necessarily destroy the feature of inspection measured by current consumption, as a new standard could be established for the various types of equipment. I am aware of one company which has had meters installed in the motor circuit only for approximately three years and has obtained a saving by their use of from 10 to 15 per cent. This is an attractive sum considering the amount of the power bill, but is not as much as could be obtained should the meters be connected to include the lighting and compressor circuits. There is no means of ascertaining the power losses incurred by improper operation of the brake valve unless meters are installed to cover all electrical units. I am confident that with an improved method of operating the controller and brake valve, additional savings in power of approximately 10 per cent in the motor circuit and from 5 to 7 per cent in the compressor and lighting circuits could be made on this property.

On our property we do not use meters except to check current consumption on our various types of cars under normal service conditions and for special tests we may wish to make. When we took up this matter of power saving we had a separate meter installed to register the amount of power used by the shops so as to give us a reasonable figure for car operation by subtracting the shop current from our total monthly bill. We figured out our monthly power consumption on a kilowatt-hour per car-mile basis for a typical month or two to obtain an average with which to compare. We also made a blind test on various runs to check with the average kilowatt-hours, obtained from the monthly bill and found them near enough to have something to shoot at.

To be even more certain of our figures, we made the test for saving on the same runs on corresponding days as for the blind test, and in each case the meter was connected so as to include the motor, compressor and lighting circuits. In view of the fact that it was not convenient to give sufficient training in our new method of operating the controller and brake valves before the tests were made, we were surprised to find that there was a difference of 25 per cent on one run and 22 per cent on two others.

Efficient Operation Depends Upon Personal Interest

Our power cost per year has averaged $130,000 for the past two years. It can readily be seen that the amount we have been paying to the power company should have been used to better advantage. It is a lot of money and one wonders why not only our company but many others have allowed it to be so carelessly expended. We all believe we are giving the proper and necessary training to our employees to obtain the minimum amount of current consumption necessary for correct and efficient operation, but we are not. I take the stand that regardless of the kind of training the operator of an electric car receives, his efficient application of the knowledge obtained depends upon the personal interest he takes in his work.



An occasional day off with pay encourages operators to keep their records clear of accidents or violations

This has been demonstrated to us by the use of the two bonuses mentioned previously. If there are any hopes of saving power either by the use of meters or automatic devices or methods dependent upon the human element for correct handling of the apparatus, it will be necessary to interest the man responsible. Let us take an average of $25,000 which has been going to the power company for several years and see how it could be advantageously distributed. We could afford to give 50 per cent of this saving to the platform men as a bonus, provided they saved it by better and more efficient operation of the equipment, and the remaining 50 per cent could be used for any other purpose we might select such as the purchase of new equipment and the like. The strange thing is that a company would not have to spend any large amount of money to obtain this saving unless it desired to purchase meters, in which case the cost of them could be taken out of your share of it.

Many economies such as those I have mentioned can be realized through the efforts of the trainman and through no one else. School the recruit from the very beginning of his service in the proper practices of car operation, follow him up with expert supervision in his every-day duties and gain his interest by sharing the profits he is earning. The results of these efforts will mean more profits to your company.

New MAINTENANCE CONTEST

Quarterly prizes and individual cash prize to be awarded on substantially the same basis as in previous contests. New plan for company award to be announced later

ELECTRIC RAILWAY JOURNAL plans to continue, during the coming year, the Maintenance Contest so successfully conducted during the past several years in co-operation with the American Electric Railway Engineering Association. The conditions and rules of the new contest are substantially the same as those of the last previous contest, except in so far as the company award is concerned. It has been decided to broaden the scope of this feature of the contest, and new rules are being formulated. These will be announced later.

The committee of judges for the contest will consist of W. W. Wysor, chief engineer United Railways & Electric Company of Baltimore; R. H. Dalgleish, chief engineer Capital Traction Company, Washington, D. C.; W. J. Quinn, electrical engineer Third Avenue Railway, New York, N. Y.; A. W. Baker, engineering secretary A.E.R.A.; and J. A. Miller, Jr., editor ELECTRIC RAILWAY JOURNAL.

Rules

1 The contest will be judged and the prizes awarded by a committee of the American Railway Engineering Association. All decisions of the judges in interpreting the conditions of the contest and in making awards will be final.

2 Quarterly prizes of $25 will be given for the best items submitted in each of four departments. The best maintenance idea submitted during the entire contest period will receive an award of $100. A minimum of $5 will be paid for each item published.

3 Articles may describe any maintenance practice or device used by any department of a railway, such as the maintenance of rolling stock, buses, shop equipment, or methods and equipment for overhead line repairs, power distribution and power generation devices, signal work, track and way maintenance, etc. The judges will determine the classification under the following divisions: (1) rolling stock and shops; (2) way and structures; (3) electrical and line; (4) buses and garage.

4 Articles submitted for these prizes should be *preferably* 100 to 200 words in length and should be accompanied by at least *one* illustration. Brevity consistent with a proper presentation of necessary information will be given weight in judging articles. In no event should they be longer than 400 words. Write on one side of the paper only. Have the article typed if possible, but manuscript written long hand will be accepted. Whenever possible include data on cost savings effected.

5 In rating the various articles the committee will consider the primary value of the method or device as of highest importance. The committee will also consider its practicability, the advantages and economies that are set forth and the clearness and completeness with which the idea is presented.

6 Any employee or official of an operating electric railway or bus company may compete for the prizes.

7 Each contestant may submit any number of items he desires, each of which will be judged separately. An individual may win several of the prizes. Manuscript must be marked "Maintenance Competition." Any number of items may be sent in the same envelope.

8 The author does not necessarily have to be the originator of the idea, but it must be adopted and be in use on the property with which he is connected. The idea submitted may have originated on another property or may have been furnished by a manufacturer. No device or method, a description of which, to the knowledge of the contestant or the judges, has been previously published, will be eligible for this competition. More than one article covering the same device or method will not be accepted.

9 Where the management of a railway has a practice of requiring approval of articles sent out for publication, such approval *must accompany* the manuscript. If written approval does not accompany the manuscript it will be assumed that such approval is *unnecessary*.

10 An article may be submitted by several persons or by a department, and need not be written by the person in whose name it is submitted. The prize will be awarded to the individual or department whose name appears on the manuscript, and may be distributed among the winners on any basis determined upon by them. Should there be a tie for any prize the full amount will be awarded for each of the articles involved in the tie.

11 All articles should be addressed to the Contest Editor of ELECTRIC RAILWAY JOURNAL, Tenth Avenue at 36th Street, New York City. Items to be eligible for the first period prizes must bear a postmark not later than Jan. 31, 1931; for the second group not later than April 30, 1931; for the third group not later than July 31, 1931.

12 The announcement of winners of departmental prizes will be made in the issue of ELECTRIC RAILWAY JOURNAL in the month following the closing date for each group of departmental prizes.

13 Material submitted in the contest may be published at any time.

14 ELECTRIC RAILWAY JOURNAL shall have exclusive right to the publication of all material entered in this contest. All articles submitted will become the property of ELECTRIC RAILWAY JOURNAL and no manuscripts will be returned.

Additional copies of these rules and full details of the contest may be obtained upon application to ELECTRIC RAILWAY JOURNAL *or the American Electric Railway Association.*



Ornamental brick construction gives attractive appearance to the two-story front of new Wyoming carhouse of the Department of Street Railways, Detroit



A spacious lobby surrounds offices of station master and cashier



Large quarters are provided for the comfort of car crews



Open-type repair pits facilitate car inspection

New Carhouse

ADDITIONAL storage and service facilities have recently been made available to the Department of Street Railways, Detroit, through the construction of a combined office building and carhouse. Carefully planned and well constructed, the building has many desirable features including excellent light, good ventilation and a pleasing appearance. It contains office quarters, a lobby, inspection pit room, workshop, car washroom, paint room, boiler room, dormitory and comfort facilities for repair men and car men.

The building is located on a large tract of land at Wyoming and Michigan Avenues in the city of Dearborn, a short distance from the Ford Motor Company plant. It is 222 ft. long and 176 ft. 8 in. wide. A two-story front faces Wyoming Avenue and extends to the rear for a depth of 36 ft. With the exception of the roof, which is of wooden construction, the entire building is of concrete, steel and masonry. Colonial face brick, laid in ornamental patterns, is used for the two-story portion of the building. This portion is also ornamented with door hoods, inset panels, pilaster caps and a heavy coping of stone.

The office quarters are on the first floor. They include the lobby, superintendents' and station masters' offices, cashiers' enclosures, a room for records and a lavatory for the office staff. The lobby is spacious and well lighted, and has a terrazzo floor in shades of buff and black. Its walls are lined to a height of 3 ft. 6 in. with a wainscot covered with imported ceramic tile in pastel shades of buff and green, bordered with black. The rest of the interior is plastered and finished with flat ivory tint.

The superintendents' and station masters' offices and cashiers' enclosures are floored with asbestos tile in a checker-board pattern, in maroon and black. The partitions are of steel, 10 ft. high, finished in imitation mahogany and are glazed with Florentine and polished plate glass. A steel staircase with terrazzo treads leads from the first floor lobby to the assembly room on the second floor. Adjoining the lobby is the record room fitted with

shelving and provided with ventilating ducts. The cashiers' enclosures are of wire mesh extending to the ceiling, and having sliding doors fitted with special locks. Illumination of the lobby and offices is obtained from ornamental hanging fixtures. Bronze-finish wall fixtures of the pocket type for indirect lighting give additional illumination in the lobby.

The entire second floor is given over to the convenience and comfort of car crews. It contains an assembly room, 34x79 ft., a locker room 34x79 ft., and a dormitory 34x38 ft. 6 in. A washroom is located near the lockers. It is equipped with shower bath, and is lighted and ventilated by a large skylight.

The pit room of the carhouse is 79 ft. wide and contains ten repair pits each 100 ft. long over which twenty cars or ten trains may be serviced at one time. Inasmuch as all track work on the premises is laid down for rotary

Built at Detroit

traffic, movement of the cars through the entire carhouse is accomplished with maximum efficiency and minimum loss of time. All repair pits are of the open type. Steel bents, light yet sturdy, support the tracks and the concrete walks. Beside the tracks, a 2-ft. open space between each rail and the edge of the walk adjoining, permits ready and convenient adjustment to running gear from both lower pit floor and walk. The space under the floor slabs is utilized for storage of spare parts and tools. It also accommodates the numerous radiators, which, in addition to the indirect heaters near the ceiling, comprise the heating facilities of the pit room. At one side of the pit room is the shop space, 36x68ft. Here the air compressor, forge, lathe, drill press and work bench are located. On the same side are also a washroom and lockers for the repairmen and an oil storage room.

Over the repair pits, giving a maximum of light and ventilation, is a skylight 24 ft. wide and 180 ft. long,



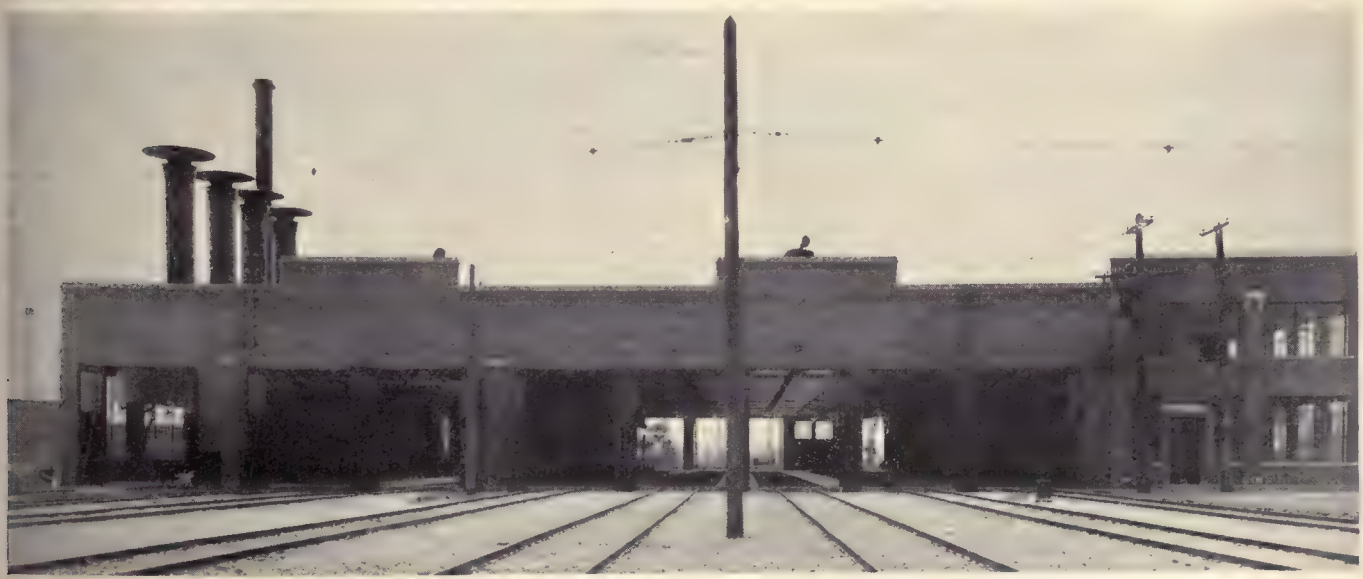
Workshop is conveniently located at one corner of pit room



Spacious washroom will accommodate eight cars at a time



Paint shop is equipped with an all-metal spray hood



Offices are on the Wyoming Avenue side at the right. Next are the inspection pits. At left are the shops

equipped with five ventilators, 48 in. in diameter, with cowls rotating on ball bearings. Adjoining the pit room is a wash rack with two tracks running its length. The facilities installed in this room will permit the cleaning and washing of eight cars at one time. Ample light and ventilation is obtained from a large skylight on the roof and steel sash in the side wall. Numerous floor drains, hot and cold-water outlets, and facilities for the installation of car-washing sprayers have been provided. A storage room for washers' supplies is also located here.

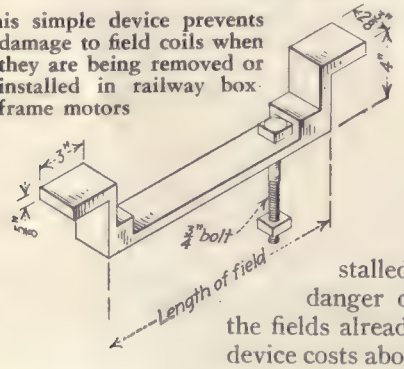
Next to the wash rack is the paint shop which is 22x120 ft. This shop is entirely fireproof, reinforced cement tile having been used in the roof construction. The all-metal spray hood for spray painting is 40 ft. wide and 61 ft. long. Two blowers at the side walls force a volume of air into trenches parallel to the track. This air is released through a longitudinal slot in the top of the trench, forming an air curtain along the object being sprayed. The spray residue carried upward by the air, is caught by the exhaust of a series of blowers connected to four ventilating stacks, 42 in. in diameter and 20 ft. high. A sprinkler system is also one of the features installed to eliminate fire hazard.

The entire building is heated by two steel tubular boilers equipped with automatic stokers. They are installed together with an auxiliary water heating boiler in a boiler room, 40x56 ft. under the easterly part of the building. In the boiler room are also located various pumps which complete the heating plant. These include duplex vacuum pumps, hot water circulating pumps and two automatic sump pumps. A large coal storage room and an ash room, in which is erected an electrically operated ash hoist, are included in the boiler room area.

Clamp for Installing Field Coils*

By R. Dumke
Foreman Mechanical Department Cleveland Railway

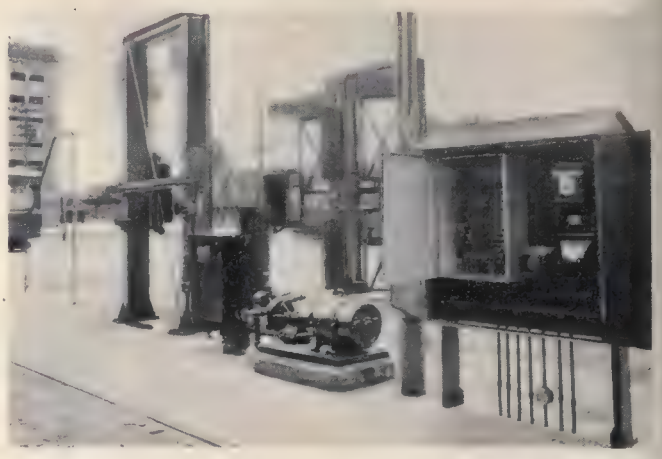
INSTALLATION of field coils in box-frame motors is facilitated by the use of the clamp illustrated, which was designed and constructed in the motor department of the Cleveland Railway. As may be seen in the illustration the device is very simple. By its means the adjacent fields can be held in place securely, while they can be shifted so as to allow the new field to be installed without any danger of injuring it or the fields already in place. The device costs about $5. It replaces the old method, in which it was necessary to remove the pole pieces in the adjacent fields in order to loosen them so that a defective field could be taken out and a new one installed. The adjacent fields had to be blocked or held in place, after which the old field was forced out and the new one forced into place. Frequently the new fields or the ones adjacent were damaged or shorted.



This simple device prevents damage to field coils when they are being removed or installed in railway box frame motors

Submitted in Electric Railway Journal Prize Contest.

Car Washing Machines Make Large Savings in Philadelphia



Car washers of this type are installed at five principal carhouses in Philadelphia. As the cars pass through the machine they are wet with the sprays, then scrubbed by rotating brushes and finally rinsed by another spray



SOME time ago the Philadelphia Rapid Transit Company began experiments in the use of car washing machines for use on its surface lines. The original machine was quite similar to that developed some time ago by the Pittsburgh Railway. After adapting the machine to the requirements in Philadelphia, five were purchased from Leeds, Tozzer & Company, of New York. The new machine, as installed at the Luzerne carhouse, is shown in the illustration.

There are two steel uprights, one on each side of the track to which swinging arms are attached. At the free ends of these arms are rotating brushes worm-driven by electric motors. At each side are two vertical pipes pierced with holes through which water sprays on to the car prior to scrubbing by the brushers, and at the rear ends of the machine are additional spray pipes for rinsing the car after the scrubbing. The electric motors and the water valve are automatically actuated by means of switches inserted in the trolley wire so that the entering car starts the motors and opens the water valve. As the car passes out the second switch shuts off the motors and the water supply.

As the cars approach the washer, the front and rear ends are wet with a hose and scrubbed by hand with brushes. The operator then starts the car and as it passes the switch the water is turned on automatically.

On the section of the trolley wire which supplies the car while it is passing through the machine, there is a series connected resistance to reduce the speed to about 1.5 m.p.h. The time taken in passing through the machine is approximately 1½ minutes. Including the time for scrubbing the ends, it is possible to put through approximately fifteen cars per hour.

Formerly fourteen men were required to wash the cars on a nine-day schedule. At present, seven men are able to wash the cars on a six-day schedule, with a much better appearance resulting. Installation of the automatic machines at five of the largest carhouses on the system has resulted in an annual saving of $28,000 per year, entirely made up of labor economy.

Grade Crossing Constructed for Heavy Vehicular Traffic

OBJECTIONABLE grade crossings which experience considerable vehicular traffic on the lines of the Stark Electric Railway, Alliance, Ohio, have been improved by the construction of a new type of permanent crossing. This has replaced the plank construction in several cities. Scrap steel rails are used with a cold pack paving material.



Cold pack is firmly tamped between rails of the crossings used by the Stark Electric Railroad

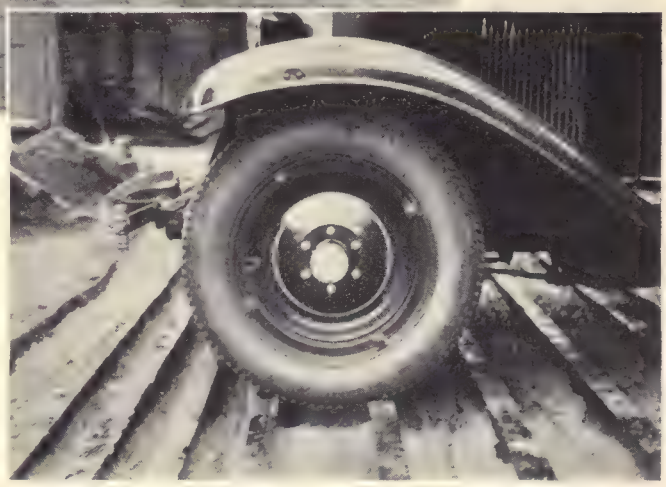


Highway crossings made with scrap rails and macadam filler give a uniform surface and last better than those made with planking

Where a crossing is to be constructed 70-lb. running rails with tie plates are placed on new creosoted ties ballasted with No. 34 slag. Joints are welded. Five lengths of scrap 70-lb. rail are placed between the running rails. Two other lengths are placed outside each running rail. The two outside rails, the running rails and the first intermediate rails are 6 in. apart. The three other inside rails are about 9 in. apart. All rails are spiked to the ties. The base and web of the rails placed between the running rails are cut off about 1 ft. from each end. The remaining heads are bent down to an angle of 45 deg. in order to prevent them from catching snow plows or other equipment operating over the crossing. Under the five intermediate rails and one outside rail on each side hardwood strips of the same thickness as the tie plates are nailed to the ties to bring all rails to the same height. The two outermost rails are therefore ½ in. below the rest.

After the rails have been laid No. 34 slag is tamped between the ties to the bottom of the rails, and above this No. 7 slag is used as a filler. Upon this a cold pack is laid up to ½ in. above the intermediate rails. Before this step, however, the slag and the rails are painted with Headly oil to make the cold pack adhere to the base. The cold pack, which is a patented product, is composed of slag and tar, mixed under heat, as the basic materials. It is tamped into place in small quantities to insure a well packed finished surface. Finally, No. 7 slag is sifted over the cold pack to take up the excess tar. No flangeway is provided, as the wheel flanges will cut their own clearance after a short time.

Crossings of this type have been constructed in the cities of Canton and Salem, Ohio, where traffic exceeds 1,500 vehicles per day. The same type of construction is to be installed on a crossing where the motor traffic will be about 10,000 vehicles per day.



Rails are spaced close enough to bear vehicular loads even without the paving

New Maintenance Contest Begins on Nov. 1

SEE RULES ON PAGE 701

Lamp Cord Used for Controller Testing*

By J. Munford
Electric Foreman, Ottawa Electric Railway
Ottawa, Canada

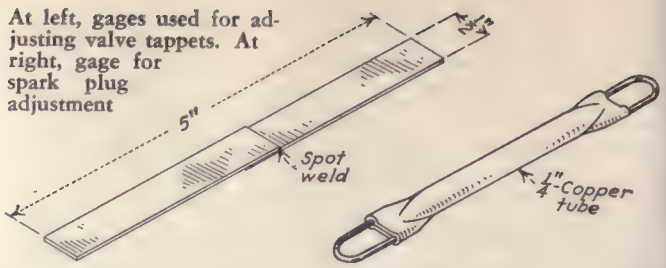
WHEN no test lights are available to test controllers for grounds, a piece of lamp cord is used instead, in the shops of the Ottawa Electric Railway. One end of the cord is connected to the bottom of any high-resistance unit on a bell interrupter. By using a screw-driver to ground various reverse fingers to the frame of the controller, open motor circuits can be located easily. This makes a handy emergency test if the conventional test lights are not available.

Simple Feeler Gages*

By Hoy Stevens
Assistant Superintendence of Maintenance Cleveland Railway

WHERE adjustments of various sorts must be made on motor coaches with definite permissible tolerances, feeler or limit gages have given the simplest and quickest method available to determine acceptance or rejectance of the work. Two places where this type of inspection has proved desirable are on valve tappets and spark plugs.

A maximum and minimum limit gage for adjusting tappets was made in the Cleveland Railway shops by spot-welding together two 3x½-in. strips of steel feeler gage stock, of which one piece is 0.004 in. thinner than the other. The thicknesses have been selected so that if the thin end will go between the tappet and the push rod while the thicker one will not, further adjustment is unnecessary. New adjustments are made to within these limits. The appearance of the gage is shown in the illustration.



At left, gages used for adjusting valve tappets. At right, gage for spark plug adjustment

The second gage illustrated has been made for adjusting spark plugs. Here, two 3-in. lengths of piano wire have been looped and inserted in the end of a 3-in. copper tube of ¼-in. diameter. One of the wires is 0.002 to 0.003 in. smaller than the other. Gages of this sort are furnished to all workmen who have use for them.

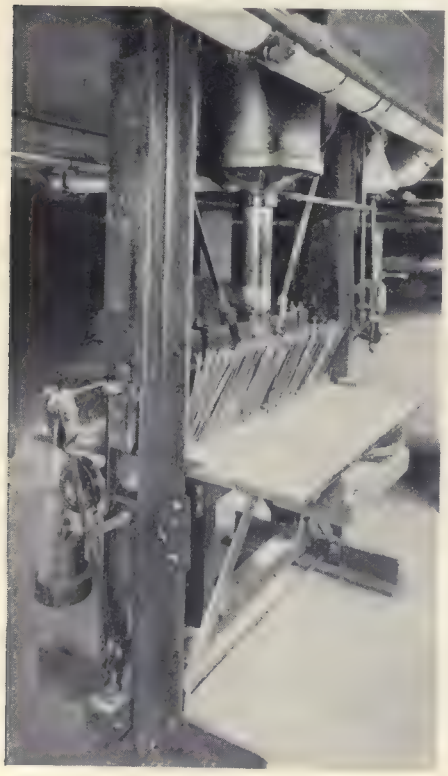
*Submitted in Electric Railway Journal Prize Contest.

Filling Sweeper Broom Blocks by Machine*

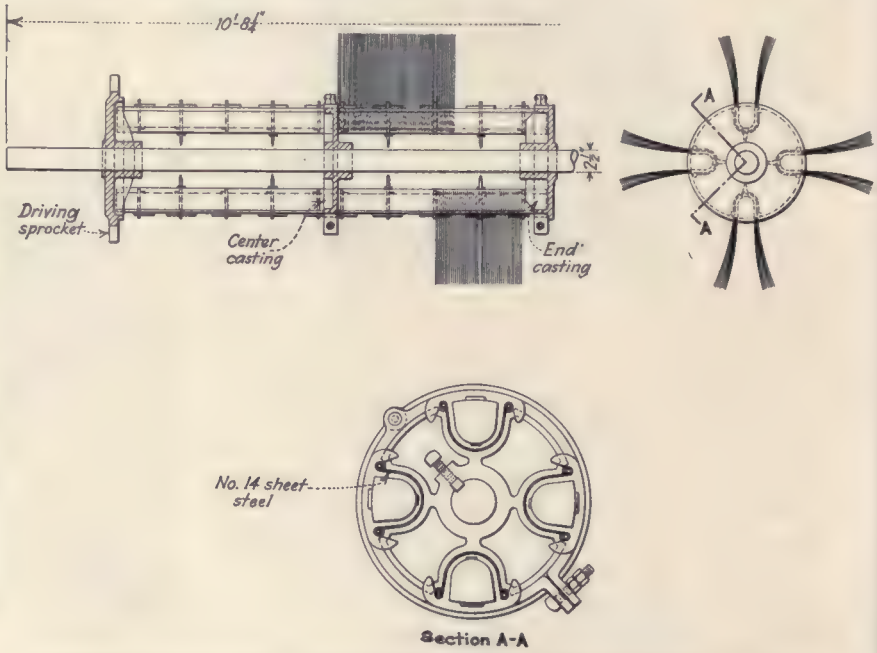
By Terance Scullin
Superintendent Equipment and Buildings
Cleveland Railway

SWEEPER broom blocks of the Cleveland Railway are now made with steel holders in a filling machine designed in the shops. The broom holder consists of a half-round channel section, closed at the ends. A locking section has lugs which pass through the channel section when the steam-heated rattan is pressed into shape by the air-operated cylinder. Pins are then placed in the holes of the lugs, binding the sections firmly together.

Under the old system it took 2½ hours to fill a wooden broom block by hand, while with the new system two men can fill sixteen of the new type broom blocks in an hour. By the use of steel holders in place of the old wooden ones, a saving of 33⅓ per cent in holder replacement was made.



Type of broom with steel holders made by Cleveland Railway

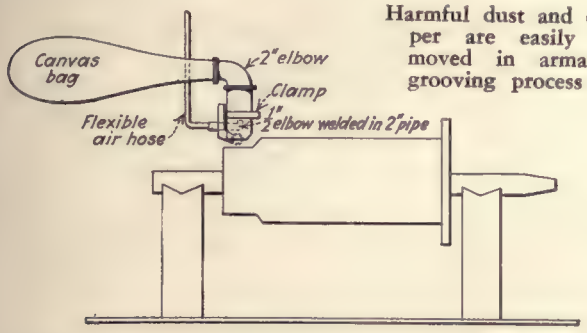


Filling of broom blocks is done quickly by this machine designed in the shops of the Cleveland Railway

Copper and Mica Dust Collected on Commutator Slotter*

By H. J. Beadle
Equipment Engineer
Dallas Railway & Terminal Company

FOR the removal of copper and mica dust from the surrounding air during the process of grooving a railway armature, it was decided to use in the shops of the Dallas Railway & Terminal Company, a device based on the ejector principle. The device is simple and cheap, and uses very little air.



Harmful dust and copper are easily removed in armature grooving process

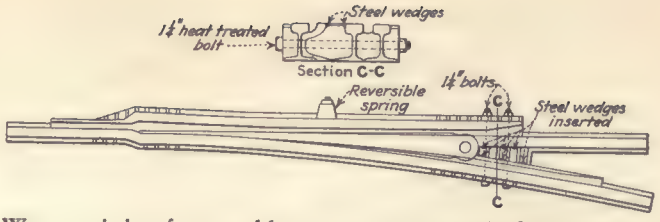
A pipe clamped to the bracket carries the saw of the grooving machine. The diameter is 2 in., so as to fit down over the saw. Inside the 2-in. pipe is a ½-in. elbow which is welded to the outside of the pipe and extends outside and beyond it for 2 in. A flexible ½-in. hose is connected to the short piece and delivers the air to the ejector. A canvas bag, placed at the end of the 2-in. pipe, receives the copper filings and mica dust.

Repairing Switches for Portable Crossovers*

By E. B. Spenzer
Special Work Engineer
Cleveland Railway

LOOSENING of the heel rails in the casting is the first sign of failure in iron-bound switches used in portable crossovers. Immediately afterward the tongue starts to work loose and soon loses its bearing at the heel and pin. It then shears off the heel fastener, without which it is unfit for service, the tongue jumping in the bed during the passage of cars and causing frequent derailments.

Practically all the 44 switches of this type belonging to the Cleveland Railway have had the heel rails work loose. Otherwise they were too good to scrap. The following method to repair them was devised, and the work was done by the local manufacturer who furnished them originally.



Worm switches for portable crossovers are repaired in Cleveland by bolting up and welding the damaged parts

First, two holes were drilled through the iron casting and rails at the heel and 1¼-in. heat-treated bolts were placed in the holes and pulled up as tightly as possible. Then small steel wedges, ⅛ in. thick and 2 in. wide were driven between rail and casting and spot welded to the rail. The remaining space was filled with spelter.

Next the tongue was refitted by spot welding on the pin and grinding off the excess metal until a bearing as good as possible was formed. A new heel fastener was fitted on and the switch tread ground at the heel to a good running surface. The other repairs consisted of building up worn guards at the heel and toe and replacing the necessary shoes on the base.

This method of repair has been extended this year due to the excellent results under traffic with switches previously repaired. The life of the switches has been doubled or more than doubled at a cost of $60 per switch, or 17 per cent of the cost new.

Berlin Street Cars Washed by Machine



Modern car washing apparatus used in Berlin, Germany

MODERN car-washing machinery has recently been installed by the street railway in Berlin, Germany. This consists of vertical perforated pipes placed on both sides of the wash track together with a pair of motor-driven revolving brushes. As with similar apparatus used by a number of electric railways in this country, the car moves slowly through the washing machine where it is first sprinkled and then scrubbed. The operation is simplified by the fact that the cars have straight sides as shown in the accompanying illustration. All cars are cleaned in this way every morning before being placed in service.

*Submitted in Electric Railway Journal *Prize Contest.*

New Maintenance Contest Begins on Nov. 1

SEE RULES ON PAGE 701

Seating Capacity of Cars Increased in Winnipeg

REMODELED cars have been recently placed in service by the Winnipeg Electric Company. Work on these cars has been in progress in the shops of the company since July with a crew of 246 men. The mechanical equipment has been thoroughly overhauled



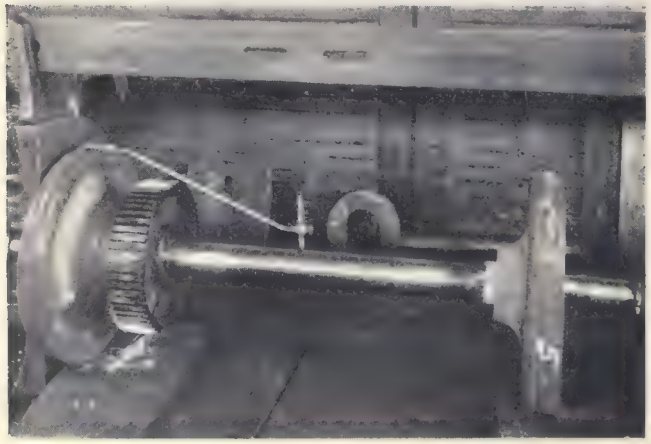
New cross-seats installed in remodeled cars at Winnipeg have increased seating capacity from 39 to 51

and renewed where necessary, and the interior has been redecorated in a more pleasing manner. Facilities have been provided for front exit to avoid the congestion experienced every winter by passengers crowding toward the rear end to alight. Slated flooring has been replaced with battleship linoleum. The seating capacity of the cars has been increased from 39 to 51 passengers by the installation of new cross-seats at a cost of $600 per car. These seats embody the latest design of interior car equipment, having leather surface and spring cushions.

Gage Makes Wheel Mounting Easy*

By Terance Scullin
Superintendent of Equipment and Buildings
Cleveland Railway

FINDING the location of the wheel first pressed on the axle is facilitated by use of a gage adaptable to all wheel sizes, which was developed by the Cleveland Railway. The gage consists of a steel rod, bent as shown in the illustration, with a casting on one end which is designed to rest on the tread and against the flange of the wheel, while the other end has a drilled knob with a knurled setscrew. This device holds a $\frac{5}{6}$-in. round steel rod about 7 in. long, pointed at one end. The setscrew fits into V-cuts in this rod spaced at the necessary distance to conform to wheels of different sizes. By making a punch mark at the center of the axle, it becomes a very simple matter by using the gage to mount the first wheel at the proper distance from the axle center, a job which has heretofore been very difficult.

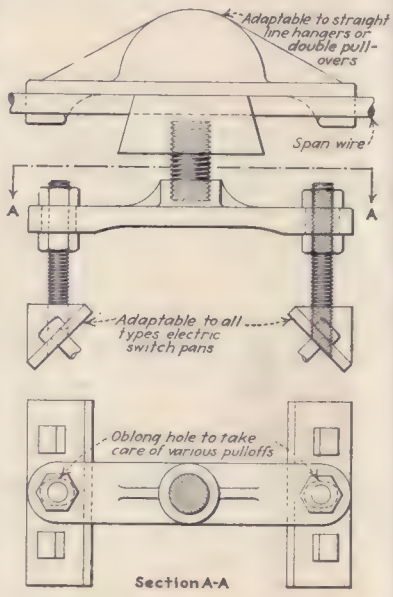


Locating the first wheel on the axle is facilitated by a gage designed in the shops of the Cleveland Railway

Adjustable Hanger for Switch Contactors*

By H. A. Brown
Foreman Return Circuit, Switch and Signal Division
Cleveland Railway

ELECTRIC track contactors on the Cleveland Railway are set and held in position by an adjustable hanger which was developed by the switch and signal division and has been adopted as standard. This hanger, which is readily adapted to any type of overhead contactor, is shown in the illustration. A casting designed for the purpose fits the top of the contactor side bars on either side. It is provided with a boss drilled and tapped to take a $\frac{5}{8}$-in. stud. A cross-member, with oblong holes, is placed over the studs and a bell type hanger is screwed into the center of the cross-member so that the contactor may be attached to the span wire. By raising or lowering the stud nuts below the cross-member, the proper position for the contactor in relation to the trolley wire is found, and the position is held by tightening the stud nuts above the cross-member.



Adjustment of electric track switch contactors is made easy by this hangar designed by the Cleveland Railway

This device replaces the old method, by which the overhead contactors were held in position by driving a staple in each of the contactor side bars, after which it was tied to the span wire with pieces of small wire. Breakage of these small tie wires would permit the contactor to turn on the trolley wire, resulting in switch failures. At best, the device was unsightly and was not satisfactory. The new device has resulted in a great reduction of electric track switch failures and a considerable cut in labor costs. When installed over the trolley wire it has a neater appearance than the old device. The hanger is easily adaptable to all types of electric switch pans.

*Submitted in Electric Railway Journal *Prize Contest.*

When Should Contact Line Be Renewed?

By Angus Scott
Assistant Superintendent of Overhead Lines
Cleveland Railway

The author proposes a formula based on relative costs of replacement and repairs

IN CONNECTION with the renewal of contact wire, the statement one hears most frequently advanced by operators is: "Take it down before it falls down." This policy is, however, productive of much waste. It is the purpose of this article to show that a better statement is: "Take it down when it costs too much to keep it up."

Contact wire renewal is divided into three general classes; namely, pieces, spans, and a complete mile or section of line from section insulator to section insulator. It is comparatively simple to determine when to renew a short piece of wire, as at an acceleration point, but to decide when to renew an entire section of line involves a number of factors. One of the chief considerations is that of taking down some wire and materials still possessing considerable capacity for wear along with the worn-out wire. The problems then presented are: (1) Should the line be repaired or restrung? and (2) Is it more economical to take down some good wire along with the worn-out wire than to repair the bad sections?

For example, consider a new 1-mile section of line on a street with varying grades and approximately nine car stops, some at the start of the grades and others at coasting points. The stops will vary in importance and the number of cars stopping will likewise vary. The differences in wire wear or burning will correspond. Then, too, some of the grades will be more severe than others, with unequal wear on the contact wire due to arcing.

After a certain number of car movements, it will be necessary to cut in pieces or spans in the places where the wear is greatest in order to maintain a suitable factor of safety, say, 0.250 in. on No. 00 round trolley wire. As time goes on the original mile will contain stretches of wire of varying cross-sections. The inspector would indicate such successive areas as follows: good, bad, good, fair, good, fair, bad, fair, etc.

Up to this point, the economical procedure in maintenance would be to cut out worn parts and replace with new wire. After a certain time this piecing fails to result in any economy on account of the labor involved, the maintenance of expensive fixtures such as splicers, and the cutting out of short pieces of wire at hard spots or acceleration points, such wire having been installed on former maintenance programs. In addition to the foregoing factors, wire which would be economical to repair in one area would not be considered so in another, due to the number of car passes.

Starting with these general facts, together with the assumptions granted, a formula is proposed for contact wire replacement:

When the over-all cost of annual repairs, including splicers, etc., aside from the normal ear replacements, approximates one-half of the cost of restringing, the contact wire should be renewed if the line receives 200,000 *or more car passes per year.*

Before renewing a section of wire on this basis the practice would be to determine sufficiently in advance just when replacement should be made in the area involved. Upon reaching this decision, all maintenance and renewal of fixtures should be stopped in this area. The time allowed before renewal should be sufficient to obtain maximum life from all the fixtures in the area.

Analyzing the cost of renewal and of repairing a mile of wire, such as the one just described, we find comparison between restringing and repairing with short pieces will be as shown in the table. The sum of $129.41 represents the actual difference between repairing and restringing the line. This will, of course, vary with the price of copper, being lower as the price is reduced.

From the above it readily may be seen that to repair wire in such condition on a line which averages 200,000 car movements per year would not be economical, since maintenance costs on a repaired line increase rapidly over normal maintenance due to the renewal of splicers and trolley armor. After operating for a year over the line following such repairs, many of the fixtures installed would have to be renewed, and also much of the original wire which was not replaced the year previous would require piecing. When the cost of this is calculated, it will, in all probability, be great enough that it will be decided to restring the entire line rather than maintain the necessary additional splicers and fittings. By restringing the line at this time, the labor and material of the previous repairs would be practically wasted. Thus it would not be economical to retain the structure by repairs for the additional year's service.

Comparison of the Cost of Restringing a Mile of 00 Trolley Wire With the Cost of Repairing It

Restringing		
Labor for stringing, insulating and aligning	$ 52.57	
1 mile of 00 wire at $19.65 cwt.	425.99	
Fixtures—ears, splicers, etc.	40.90	
Total cost of restringing	$519.46	
Salvage value at 14 cents per lb., wire 70 per cent by weight	221.05	
Actual renewal cost		$298.41
Repairing		
Labor for stringing 1,000 ft. of wire at 5 cents per foot	$ 50.00	
Ear renewal on periods skipped	20.00	
1,000 ft. of 00 copper, salvage allowed	40.00	
Ears, splicers, armor, etc.	29.00	
Maintenance above normal on repaired line per year	30.00	
Cost of repairing for 1 year		$169.00
Net cost of restringing		$129.41

In the cost of repairing the line there is an item of $20 for labor and material for ear renewal periods skipped. This item is included there because if it were decided to restring the line rather than repair it, ear renewals would be skipped for a number of months, saving the labor and material which would be required if the line were repaired.

Results from actual experience show that the labor costs of repairs and inspections on a line remain fairly constant up to about 500,000 car movements. Then the cost of maintenance increases rapidly due to the cutting

in of pieces or protection of acceleration points. Costs should be computed when No. 00 standard hard-drawn trolley wire approaches 1,000,000 car movements. Extensive repairs undoubtedly will be required then on a line averaging 200,000 car movements per year depending, of course, on the kind of wire and class of service. If it is found that the cost of repairing ($169) is approximately equal to one-half the cost of renewal ($298.41), the wire should be restrung.

The writer does not contend that the formula proposed is applicable to all wire renewals. It is his belief, however, that a formula covering wire renewals could will be developed by the industry. His experience suggests that the straight line formula proposed, rather than the parabolic formula of increasing annual expenditures, will apply very well to contact wire renewals.

Motor Field Shunting Gives Old Cars New Pep

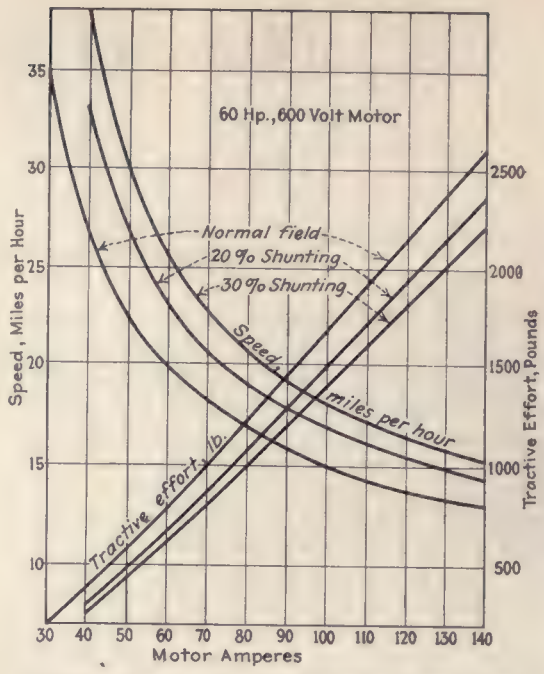
By G. L. Moses
Renewal Parts Engineer
Westinghouse Electric & Manufacturing Company

IMPROVEMENT of schedules is possible by the adoption of a relatively simple means of speeding up street cars. It has long been known that shunting part of the current of a series railway motor around the field results in an increase of speed. Recent agitation to increase schedule speeds has led to extensive investigations of the commercial feasibility of such a scheme. Field shunting is accomplished by the addition of a few switches with a controlling relay and helical resistor units. This provides an extra accelerating point after the full parallel running position has been reached and increases the free running speed of the car. Tests conducted thus far indicate that considerable increases in schedule speeds are possible in many cases with field shunting.

From an economic standpoint this is of great value as the increase in schedule speed permits better service with the same equipment, or reduces the amount of equipment required for a given service. The cost of the equipment plus the cost of installation is slight compared to the benefits which can be derived from field shunting properly employed. Field shunting is equally applicable to drum or remote control and requires little or no wiring change. Wherever operating companies intend to operate existing cars over the same line at higher speeds, the possibilities of field shunting are well worth a careful investigation.

This scheme has its limitations. Faulty overhead construction, permitting the trolley to disengage, is liable to cause motor flashing. Some types of motors are more adaptable to field shunting than others. These are motors that have a reserve capacity and are free from commutation difficulties with weakened field strength. Helical, edge-wound resistors are used as field shunts on account of their light weight and their inductive characteristic, which reduces the tendency of commutators to flash. It is advisable to use a current limit relay to insure that the field shunting switches are not closed before the motor current is reduced to a safe value. If this is not done, the motors may be unreasonably overloaded, and have a decided tendency to flash.

The percentage of the motor field current which may be safely shunted depends upon the construction of the motor and upon its application. It is necessary to keep within the proper current limits so that excessive heating will not result. Weakening a motor field naturally has a detrimental effect on commutation. Therefore, if we disregard the heating effect, the ultimate limits of shunting is determined by the result on commutation. Each particular application represents a special problem and is worthy of careful consideration. Each operator should try out the scheme on his own equipment and service which he desires to speed. He can then best determine the operating advantages which can be obtained within the limits of his particular application.



Railway motor characteristic curves show effect of field shunting

Copenhagen Orders Experimental Cars

WITH the idea of modernizing its rolling stock, all of which has now been in service for at least ten years, the electric street railway in Copenhagen, Denmark, has built a motor car and a trailer of improved design. Owing to the narrowness of the streets and the sharp curves, single-truck motor cars and trailers have been used in the past. The new cars are of the double-truck type, the motor car seating 28 passengers and the trailer 26. In general the cars follow American design practice, the motor car having end platforms and the trailer a center platform. The over-all length of each car is 46 ft. $4\frac{5}{8}$ in. and the width 6 ft. $10\frac{3}{4}$ in. It has been decided to spread the track centers so that the width of future cars can be increased to 7 ft. $2\frac{1}{2}$ in.

Considerable interest centers in the motor and truck design. Four air-cooled motors rated at 21 kw. at 275 volts and 1,200 r.p.m. continuous load are connected two in series. The drive is through single reduction gears with a ratio of 6 to 1.

If the tests made with these cars show that they meet the demands of Copenhagen's traffic, it is understood that orders for a large number will be placed during the next twelve months.

NEW PRODUCTS for the Railways' Use



Seating arrangement has been developed to facilitate circulatory loading

Small-Capacity Bus With Circulatory Loading

SIMILARITY of construction detail to the larger types has given to the small-capacity, single-engine bus, recently developed by the Twin Coach Corporation, the advantage of circulatory loading. Front-entrance and rear-exit facilities, together with a novel seating arrangement to fit, have made this feature possible.

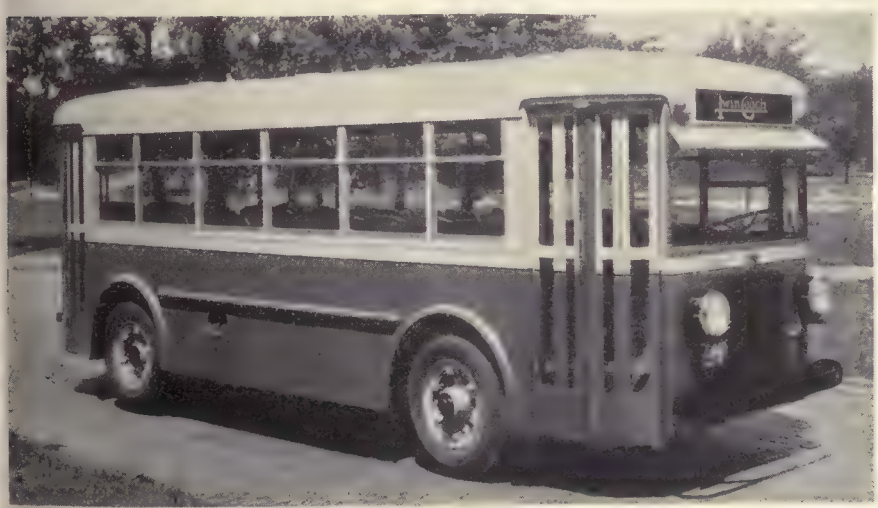
Construction of body and frame is of high-grade steel; body posts are of cold-rolled T-section. All metal joints are painted and primed before assembly with rust-resisting paint. Body sides, ends and roof are sealed with compound. To prevent corrosion, panels are riveted to the body posts and roof carlines with specially treated rust-resisting rivets.

The doors are air operated, each having a 23-in. full opening. The front entrance door is placed ahead of the front wheel, and the rear exit door is placed behind the rear wheel. Seating equipment consists of two-passenger, bucket type seats on the left side and either individual bucket seats on the right side at an angle or longitudinal wheelhouse seats at the front and rear with single forward seats between them. The aisle space provided with this arrangement varies from 15 to 18 in. Seating capacity varies from 20 to 24 passengers depending upon arrangement of seats.

The bus is equipped with a new 4⅛-in. bore Twin Coach engine, developing 90 hp. Ample brake capacity and long life are assured with four-wheel air brakes using large-size shoes and drums. The rear axle has a bevel gear drive, and the front axle has an especially heavy I-beam section. Both are Timken. The tires are the new 9.00x18 size, with a capacity of 3,600 lb. per tire. Drive shaft is mounted in one midship bearing supported by special rubber mountings to eliminate noise. Steering mechanism is the Ross cam and lever type. Electrical equipment and air brake equipment accessories, transmissions, clutch and drive lines are the same as found in the large Twin bus.

GENERAL DIMENSIONS

Over-all length, without bumpers and visors	21 ft. 3 5/16 in.
Over-all length, with bumpers and visors	22 ft. 10¾ in.
Over-all height, loaded	99½ in.
Over-all width	86 in.
Wheelbase	140 in.
Tread—front and rear	6 ft.
Turning radius—approximate	28 ft.
Interior headroom	73 in.
Step height from ground, unloaded	16 in.
Floor height from ground, unloaded	28⅜ in.
Road clearance, minimum under front axle	7 in.
Road clearance, minimum under rear axle	10 in.
Weight, approximate	10,000 lb.



Front entrance and rear exit facilities are incorporated in design of new small-capacity bus built by Twin Coach

Paint to Provide Protection Against Corrosion

AS THE result of research carried out by the chemical and technical staffs of E. I. du Pont de Nemours & Company, a product known as DuLux has been developed, which imparts some of the advantages of Duco to finishes of the paint and varnish type.

It is stated that the product is based on a film-forming material that is an especially developed synthetic chemical compound exceptionally resistant to disintegration. It differs radically in this respect from the natural oils and resins generally used in the manufacture of paints, varnishes and enamels.

A coating of this product dries more quickly than the ordinary finishes, thus greatly reducing the time during which freshly coated surfaces are subject to marring by insects or dust. It is claimed to be unusually resistant to rain damage during the drying period. Laboratory tests, which have been confirmed by thousands of panels exposed to the elements in various sections of the United States, indicate that the new product provides surface protection for an unusually long period of time.

DuLux is now available for industrial uses, including the finishing of machinery and the coating of structural steel, bridges, freight cars and other places where resistance to weathering and corrosion is required.

Pulsator for Track Work Under Traffic

ADDITIONAL models of "mortar-flow" pulsators have just been put on the market by the International Steel Tie Company. These new machines are designed for use where the traffic can not be taken off the track and, like the standard machine, vibrate the rails and ties during the concreting operation. The purpose of vibration is to insure filling all voids under the rail base and around and under ties, steel tie plates and joints. Vibration also waterproofs the track structure by making a better bond between steel and concrete than is possible by hand methods.

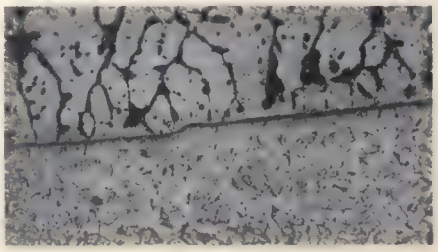
The two new models are designed generally for under traffic work. One machine is illustrated in two positions, (1) clamped to the rails, and (2) partly removed from the track. It has a single axle about which the whole unit is balanced, and which carries two rubber-tired derail wheels. The derail wheels and axle, when thrown into position by a lever, lift the unit up clear of the rail, allowing the machine to be conveniently run off the track to the side on a portable track.

A feature of the new machine is that it utilizes field tested principles of design and details worked out in two years experience with the standard flange-wheel truck model. The vibrating unit is identical with the larger machine and clamps both rails. The motor operation is by Cutler-Hammer automatic controller and push buttons. The machine is equipped with S.K.F. ball bearings and Alemite lubrication. All wiring is in conduit.

The other new model is a portable vibrating unit, easily carried by one man. It is driven by a flexible shaft drive from a 550-volt direct-current motor at the side of the track, mounted on a small two-wheel rubber tired truck.

Steel-Backed Bearing Metal for Heavy-Duty Service

WELDING a thin layer of copper-lead alloy to a steel backing has been a recent development of the Kalif Corporation, Emeryville, Cal. The steel-backed bearing thus produced is said to combine the physical properties of the finely grained copper-lead alloy to give a material with strength and a low coefficient of thermal expansion. This type of bearing is particularly applicable to heavy-duty service encountered in automotive engines and electric cars.



Photomicrograph of 100 diameters shows uniform bond between the copper-lead alloy and the steel back

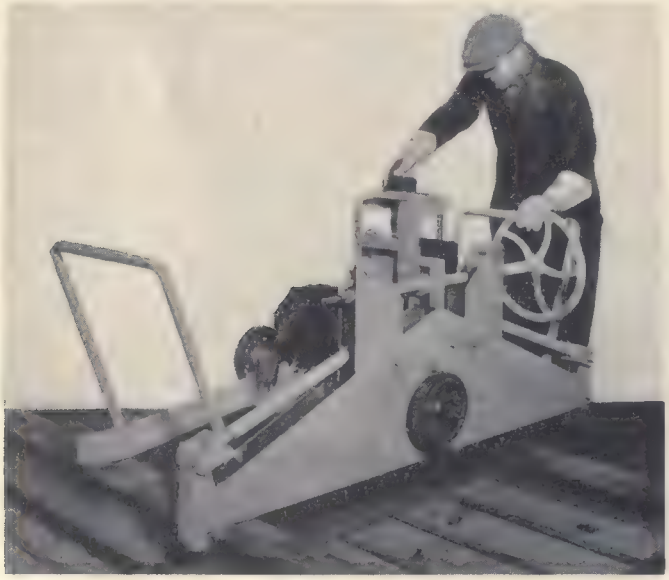
The copper-lead alloy contains about 25 per cent lead and is cast upon the steel back by a centrifugal process to form a thin homogeneous layer about $\frac{3}{32}$ in. thick. It is claimed that the alloy itself has six times the heat conductivity of ordinary babbitt, and about $3\frac{1}{2}$ times the heat conductivity of bronze. This quality, together with its high melting point, will lessen the probability of the bearing melting by frictional heat.



Full floating bushing welded with a 3/32-in. finish of bearing metal on all faces

Compact Taximeter for Installation on Dash

TO MEET the increasing demand for a taximeter, compact and small enough to be installed on the dash of any automobile, the Ohmer Fare Register Company announces the development of a meter of simple type to be designated as Model 99. Although small and light, this meter is said to possess the accuracy and durability of the larger types and to perform every function that is required of any non-printing meter.



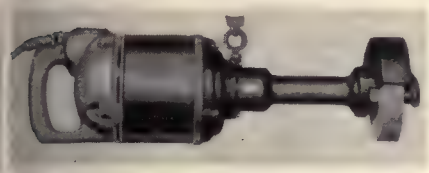
New model "mortar-flow" pulsator for under-traffic work clamped to the rails



Machine being removed to the side of the track to allow car to pass

On the face of the meter, in large white figures, is indicated the fare to be paid. The extra fare for additional passengers or extras is also clearly indicated on the meter face. Sets of visible totalizers are placed on the back of the meter to give the cab operator the necessary information concerning total paid miles, total dead miles, number of trips, number of passengers carried, number of extras, total amount of money collected for the day and income per cab-mile.

Portable Hand Grinders



Grinders are equipped with 10 ft. of rubber cable and connector plug for operation from lamp sockets

TWO portable hand grinders rated at 1 hp. and 2 hp. capacities, for both direct and alternating-current operation, have been placed on the market by the Hisey-Wolf Machine Company, Cincinnati, Ohio. The motors of these grinders are rated for continuous duty and the mechanical parts are designed for heavy-duty service. They are provided with ball-bearing motors and Timken roller bearing grinding spindles.

The 1-hp. grinder has a no-load speed rating of 3,400 r.p.m., and a net weight of 85 lb. The 2-hp. grinder has a no-load rating of 2,200 r.p.m., and a net weight of 320 lb. The standard equipment consists of grinding wheel, adjustable and approved steel wheel guards, 10 ft. of rubber cable, connector plugs and a suspension spring.

The manufacturer recommends the use of a 2-hp. machine and a 1-hp. machine for economy. When the original 10-in. diameter grinding wheel for the 2-hp. grinder is worn to 8 in., it can be transferred to the 1-hp. machine operating at a higher speed, thereby maintaining the original efficiency.

New Maintenance Contest Begins on Nov. 1

SEE RULES ON PAGE 701



New Mack "salon club car"

Mack "Salon Club Car" Bus Offers Luxury for Long-Distance Travel

DESIGNED for luxury and riding comfort in long-distance travel, a Mack "salon club car," with a capacity of 23 passengers, has been introduced. Radical departures from conventional designs have been made in the seating arrangement and interior equipment. The bus is divided into three sections and the body is mounted on a Mack Model BK chassis.



Luxuriously furnished salon is separated from the driver's section by a bulkhead



Solarium at the rear contains a radio and heating unit placed in an attractive cabinet

The driving compartment is separated from the passenger section by a built-in bulkhead which materially reduces the sound of the motor. Isolation of the driver and steward from the passengers is thus obtained. Club chairs of the railroad type have been adopted to insure comfort and satisfactory relaxation.

Entrance at the front is through a cabin-lounge, seating five passengers. If necessary, this lounge may be made up into two berths for the crew. A side door leads into the salon which accommodates ten persons. Six of the seats are of the movable club-chair type. Built into the forward bulkhead is a buffet, water cooler and small refrigerator. Luncheon or refreshments may be served by placing small table attachments on each of the arm chairs and by setting up the Pullman tables. These tables may also be used for card playing.

From this middle section, a 16-in. aisle leads between four back-to-back seats, above the wheel-housings, opening into a solarium having four movable club chairs. The solarium contains a radio and a heater, concealed within the radio cabinet. Here the window construction permits an uninterrupted view through both sides and rear.

Windows are equipped with roller screens, keeping out dirt while admitting air. Electric fans and ventilating fans in the rear portion of the roof change the air every 60 seconds.



Front lounge may be converted into berths for the crew

Monthly and Other Financial Reports

	Interborough Rapid Transit Co. New York, N. Y.		Steinway Railway New York, N. Y.		Third Avenue Ry. System New York, N. Y.		Metropolitan Railway Paris, France		City of Aberdee Tramways Aberdeen, Scotla	
	1930[2]	1929[2]	1930[2]	1929[2]	1930[2]	1929[2]	1929[3]	1927[3]	1930[5]	1929[5]
Railway operating revenues	$72,391,867	$69,174,294	$798,749	$830,885	$17,618,580	$17,882,851	413,500,327	386,251,330	£258,308	£248,3
Railway operating expenses	45,401,438	42,344,462	861,613[1]	807,261[1]	14,096,467	14,454,768	281,297,653	242,129,595	207,390	192,(
Net revenue, railway oper	$26,990,429	$26,829,832	.....	.....	$3,522,112	$3,428,082	132,202,674	144,121,735	.....	.....
Taxes	2,522,435	2,393,735	.....	.....	1,155,440	1,154,797	33,840,498[4]	31,946,926[4]	.....	.....
Operating income	$24,467,994	$24,436,097	*$62,864*	$23,624	$2,366,672	$2,273,285	98,362,186	112,174,809	£50,917	£45,(
Non operating income	356,040	561,435	3,870	5,655	298,837	276,900	1,640,271	1,813,627	.....	.....
Gross income	$24,824,034	$24,997,532	*$58,994*	$29,279	$2,665,509	$2,550,185	100,002,457	113,988,436	£50,917	£45,(
Deductions from gross income	24,196,662[6]	19,027,182[6]	63,488	63,962	2,861,528	2,837,254	89,334,170	103,245,940	34,855	33,(
Net income	$627,372	$5,970,350	*$122,482*	*$34,683*	*$196,018*	*$287,069*	10,628,287	10,742,496	£16,061	£15,'
Operating ratio	0.627	0.611	.....	.....	0.800	0.814	0.680	0.627	.....	.....

[1] Including taxes. [2] Year ended June 30. [3] In French francs. [4] Royalty due City of Paris. [5] Year ended May 31. [6] Includes rentals and amounts payable to city under contract No. 3.

	Operating Revenue $	Operating Expenses $	Taxes $	Gross Income $	Net Income $
Market Street Railway, San Francisco, Cal.					
September, 1930	745,298	626,770*a*	.....	118,528	64,731
September, 1929	787,449	651,158*a*	.....	136,291	77,378
12 mo. end. Sept., 1930	9,365,644	7,904,409*a*	.....	1,461,235	793,312
12 mo. end. Sept., 1929	9,570,846	8,139,777*a*	.....	1,431,069	710,375
Northwestern Pacific Railroad, Sausalito, Cal.					
August, 1930	638,476	379,655	35,847	222,944	210,115*d*
August, 1929	720,813	474,172	36,539	210,068	201,973*d*
8 mo. end. August, 1930	3,805,872	3,324,630	288,271	192,634	135,092*d*
8 mo. end. August, 1929	4,049,904	3,544,000	302,496	203,072	179,325*d*
Capital Traction Company, Washington, D. C.					
September, 1930	327,713	243,059	25,007	60,389	30,259
September, 1929	330,039	247,256	25,200	58,543	28,342
9 mo. end. Sept., 1930	3,073,934	2,260,967	.....	.....	320,390
9 mo. end. Sept., 1929	3,194,057	2,295,305	.....	.....	396,899
Washington Railway & Electric Co., Washington, D. C.					
12 mo. end. June, 1930	5,638,415	3,571,937	408,171	3,318,092*c*	1,964,409
12 mo. end. June, 1929	5,798,648	3,683,994	450,276	3,180,312*c*	1,775,194
Jacksonville Traction Company, Jacksonville, Fla.					
August, 1930	77,441	69,350	8,827	*1,100*	.....
August, 1929	88,098	81,387	9,332	*2,996*	.....
12 mo. end. Aug., 1930	1,074,576	876,399	105,999	85,927	*68,188*
12 mo. end. Aug., 1929	1,162,859	947,560	107,034	101,982	*56,867*
Honolulu Rapid Transit Co., Honolulu, Hawaii					
August, 1930	86,480	50,902	9,149	27,479	16,326
August, 1929	87,963	51,366	7,975	29,609	18,339
8 mo. end. August, 1930	683,810	408,042	71,455	224,353	131,090
8 mo. end. August, 1929	703,775	403,167	74,236	235,044	145,213
Chicago Surface Lines, Chicago, Ill.					
September, 1930	4,568,564	3,789,472*a*	.....	779,092	.....
September, 1929	5,048,055	4,011,961*a*	.....	1,036,094	.....
Boston Elevated Railway, Boston, Mass.					
August, 1930	2,280,322	1,964,895	148,288	172,827	*531,494*
August, 1929	2,473,665	2,021,243	125,252	332,263	*361,650*
Kansas City Public Service Co., Kansas City, Mo.					
August, 1930	622,554	488,419	41,675	76,980	15,479*b*
August, 1929	717,306	556,639	41,675	118,991	43,123*b*
8 mo. end. August, 1930	5,536,988	4,348,061	333,400	627,124	228,402*b*
8 mo. end. August, 1929	5,949,988	4,493,970	333,400	1,122,617	496,479*b*
Illinois Terminal Railroad, St. Louis, Mo.					
August, 1930	661,520	432,250	34,566	194,675	152,827*d*
August, 1929	716,269	507,518	23,462	185,289	136,270*d*
8 mo. end. August, 1930	5,024,689	3,514,676	234,565	1,275,341	932,973*d*
8 mo. end. August, 1929	5,474,869	3,800,405	187,697	1,486,640	1,106,207*d*
Fonda, Johnstown & Gloversville R.R., Gloversville, N. Y.					
August, 1930	64,592	57,684	4,800	17,376	*12,690*
August, 1929	79,251	60,217	7,840	21,701	*9,300*
8 mo. end. August, 1930	610,217	494,721	38,400	139,553	*109,291*
8 mo. end. August, 1929	672,907	511,706	62,720	188,891	*67,309*
Brooklyn-Manhattan Transit System, New York, N. Y.*e*					
September, 1930	4,834,251	3,113,255	340,176	1,440,564	667,323
September, 1929	4,957,833	3,265,942	350,716	1,407,024	628,452
3 mo. end. Sept., 1930	14,575,451	9,620,058	1,000,955	4,167,964	1,852,769
3 mo. end. Sept., 1929	15,053,385	10,286,538	982,859	3,990,989	1,640,610
Brooklyn & Queens Transit System, New York, N. Y.					
September, 1930	1,887,499	1,446,803	117,468	337,818	213,728
September, 1929	1,979,804	1,533,161	125,086	343,167	219,589
3 mo. end. Sept., 1930	5,631,856	4,428,135	335,285	911,642	538,026
3 mo. end. Sept., 1929	5,975,977	4,757,860	344,138	937,908	564,100
Hudson & Manhattan R.R., New York, N. Y.					
September, 1930	974,433	506,845*a*	.....	467,588	132,332
September, 1929	1,002,525	505,112*a*	.....	497,413	162,732
9 mo. end. Sept., 1930	9,115,430	4,614,702*a*	.....	4,500,728	1,485,893
9 mo. end. Sept., 1929	9,264,632	4,698,250*a*	.....	4,566,382	1,544,005
Long Island Railroad, New York, N. Y.					
August, 1930	3,968,936	2,137,838	497,538	1,333,560	1,152,651*d*
August, 1929	4,186,924	2,316,651	459,374	1,409,949	1,233,931*d*
8 mo. end. August, 1930	26,775,333	17,851,352	2,141,756	6,776,733	5,531,078*d*
8 mo. end. August, 1929	27,769,055	18,180,164	1,977,470	7,596,602	6,336,344*d*
New York Railways, New York, N. Y.					
August, 1930	457,247	408,567	.....	48,680	10,762*a*
August, 1929	537,699	462,590	.....	75,109	13,286*a*
8 mo. end. August, 1930	3,674,872	3,327,412	.....	347,460	24,586*a*
8 mo. end. August, 1929	4,160,976	4,656,868	.....	504,108	17,688*a*
New York, Westchester & Boston R.R., New York, N. Y.					
August, 1930	196,405	125,759	26,420	46,911	*184,982*
August, 1929	219,536	128,879	23,925	67,526	*151,070*
8 mo. end. August, 1930	1,704,903	954,853	203,559	553,503	*1,288,332*
8 mo. end. August, 1929	1,671,155	1,017,382	177,606	482,049	*1,237,381*
Staten Island Rapid Transit Co., New York, N. Y.					
August, 1930	233,371	151,110	17,000	65,316	49,486*d*
August, 1929	271,165	171,506	17,800	81,859	74,894*d*
8 mo. end. August, 1930	1,679,294	1,244,268	137,500	296,009	225,497*d*
8 mo. end. August, 1929	1,749,107	1,336,928	140,800	271,362	221,579*d*
Third Avenue Railway System, New York, N. Y.					
August, 1930	1,350,064	1,088,105	92,748	193,116	*46,540*
August, 1929	1,434,607	1,190,080	94,637	174,225	*64,945*
2 mo. end. August, 1930	2,779,795	2,204,836	188,328	434,573	*44,473*
2 mo. end. August, 1929	2,942,468	2,418,675	192,107	380,391	*97,421*
Philadelphia & Western Ry., Norristown, Pa.					
August, 1930	47,889	.....	.....	.....	*1,684*
August, 1929	60,556	.....	.....	.....	12,061
8 mo. end. August, 1930	450,787	.....	.....	.....	37,876
8 mo. end. August, 1929	520,795	.....	.....	.....	89,847
Memphis Street Railway, Memphis, Tenn.					
July, 1930	210,185	154,532*a*	.....	55,652	8,871*b*
July, 1929	233,113	171,313*a*	.....	61,810	17,576*b*
12 mo. end. July, 1930	2,833,509	1,914,679*a*	.....	919,561	378,970*b*
12 mo. end. July, 1929	2,924,380	1,992,939*a*	.....	934,435	412,054*b*
Galveston-Houston Electric Ry., Houston, Texas					
August, 1930	47,425	25,871	2,531	19,021	.....
August, 1929	53,563	28,322	2,588	22,652	.....
12 mo. end. Aug., 1930	529,519	308,930	32,524	188,256	*82,135*
12 mo. end. Aug., 1929	605,660	336,470	31,849	237,340	*33,350*
Houston Electric Company, Houston, Texas					
August, 1930	244,033	155,710	21,742	66,579	.....
August, 1929	278,581	172,479	26,681	79,420	.....
12 mo. end. Aug., 1930	3,195,078	2,009,693	250,455	951,448	573,872
12 mo. end. Aug., 1929	3,384,034	2,095,336	288,724	1,002,838	598,891
Calgary Municipal Railway, Calgary, Alta.					
8 mo. end. August, 1930	660,373	420,321	.....	240,052	27,860
8 mo. end. August, 1929	.....	.....	.....	.....	50,574
Edmonton Radial Railway, Edmonton, Alta.					
August, 1930	55,330	43,449	.....	11,880	*6,346*
August, 1929	58,582	44,398	.....	14,183	*5,164*
8 mo. end. August, 1930	545,834	367,291	.....	178,543	*4,934*
8 mo. end. August, 1929	559,974	358,508	.....	201,466	9,681
British Columbia Electric Ry., Vancouver, B. C.					
July, 1930	1,196,239	791,431	.....	404,808	.....
July, 1929	1,156,720	786,085	.....	370,635	.....
August, 1930	1,194,390	645,156*a*	.....	549,234	.....
August, 1929	1,168,753	642,308*a*	.....	526,445	.....
2 mo. end. August, 1930	2,390,629	1,285,921*a*	.....	1,104,708	.....
2 mo. end. August, 1929	2,325,473	1,281,764*a*	.....	1,043,709	.....
Regina Municipal Railway, Regina, Sask.					
8 mo. end. August, 1930	271,982	188,258	.....	83,724	*39,657*
8 mo. end. August, 1929	.....	.....	.....	.....	13,616

Italic figures indicate deficit. *a* Includes taxes. *b* Before depreciation. *c* Includes net revenue of Potomac Electric Power Co. *d* Net after rents. *e* Including Brooklyn & Queens Transit System.

NEWS *of the Industry*

LATE NEWS

Rockford, Ill.—A. P. Lewis of the Rockford Electric Company has indicated that new trolley buses will be operating here by Dec. 1. The new buses will supplant street cars on the North Church and North Main Street lines, the Harlem Boulevard and connecting routes.

✦

Vancouver, B. C.—The Prince George City Council has tentatively approved an agreement under which the Canadian National Railway will be supplied with electric power from the municipally owned plant for five years, on a sliding scale.

✦

Boston, Mass.—Boston, Revere Beach & Lynn Railroad stockholders have approved a plan to issue $2,200,000 of bonds, the proceeds to be used to retire $1,000,000 of 4½'s at 103 and $1,000,000 of 6's at 102.

✦

St. Louis, Mo.—The St. Louis Public Service Company is operating one-man cars on its Southampton line. For this service 40 cars were rebuilt and equipped with automatic doors, electric heaters and leather-faced seats. The cars have pedal control. With an increase in the number of cars the time between cars has been cut to 1½ minutes during the rush hours and to 4½ minutes in non-rush periods.

✦

Trenton, N. J.—The State Board of Public Utility Commissioners has approved the application of Public Service Co-ordinated Transport to operate twelve additional buses between West Orange and Newark, and Public Service Interstate Transportation Company to operate ten extra buses between Orange and Newark.

✦

Louisville, Ky.—By resolution adopted on Oct. 15 a committee composed of John Stites and Charles A. Heuser is to inquire into any additional economies which seem advisable for Louisville Railway and report at the next meeting with recommendations for any eliminations or reductions regarded as possible without impairing company efficiency. A resolution was also endorsed by the directors ordering $100,000 to be paid on $600,000 of demand notes at the local banks, to reduce indebtedness and lessen interest charges. Meanwhile, action on dividends has been deferred.

✦

St. Louis, Mo.—President Neun, of the Board of Aldermen, St. Louis, Mo., on Oct. 10 referred to a joint aldermanic committee the report of the transportation survey commission which contained recommendations for the improvement of mass transportation in St. Louis. Mr. Neun urged the joint committee to study the report carefully and submit such legislative measures to the entire board as deemed advisable to carry out the recommendations of the commission.

(*Late News Continued on Page* 116)

Association Affairs Reviewed by Executive Committee

Financial Affairs in Good Shape. Committee on Financing of New Cars to Be Appointed. Cleveland Railway Accepts Journal's Maintenance Plaque

MANY phases of the work of the American Electric Railway Association were discussed at an executive committee meeting held in New York on Oct. 10. The report of the committee on policy, presented by G. A. Richardson, chairman, recommended that no definite action be taken at this time concerning the plan of having exhibits in alternate years at A.E.R.A. conventions. The policy committee also recommended the appointment of a committee on car financing. Both recommendations were approved by the executive committee. Work of the publicity committee was outlined by Labert St. Clair in the absence of Barron Collier, chairman. At the request of Col. J. H. Alexander, chairman of the membership committee, its report was presented by F. C. J. Dell.

Details of the financial status of the association were presented by F. W. Doolittle, chairman of the finance committee. He stated that due to careful management and certain fortuitous circumstances, the financial status was better than had been anticipated. The committee recommended the continuance of the present 10 per cent reduction from the regular schedule of dues. This was approved by the executive committee.

Reporting for the committee on national relations, C. D. Cass, general counsel of the association, spoke of the recommendations of the National Association of Motor Bus Owners on the subject of interstate bus regulation. The executive committee indorsed the resolution of that association. W. E. Wood, chairman publications committee, said efforts made to secure wider distribution of *Aera* had not met with marked success, and that the publication committee was planning to hold a meeting in the near future to consider this problem.

Advantages resulting from the work of the committee on insurance were outlined by H. B. Potter, chairman. He pointed out that the rate reduction made by the stock fire insurance companies through the work of the committee had resulted in an annual saving to the industry greater than the annual expense of running the association.

Charles Gordon, managing director, spoke briefly of his recent activities. He said that studies made by the association had developed the fact that travel by auto was 23 times as hazardous as travel by trolley on the basis of fatalities per passenger-mile. Mention was made of the work of the presidents' conference committee, and Mr.

(*Continued on Page* 717)

COMING MEETINGS

Oct. 29-30—Iowa Electric Railway Association, Des Moines, Iowa.

Nov. 12-15—National Association of Railroad and Public Utility Commissioners, annual meeting, Charleston, S. C.

Indianapolis Deposits Satisfactory

Security deposits for the proposed reorganization of the Indianapolis Street Railway is proceeding at a satisfactory rate. Secretary Wichmann of the committee representing owners of the Citizens' Street Railroad 40-year 5 per cent bonds reported 70 per cent surrendered with no withdrawals. John P. Collett, secretary of the group holding Indianapolis Street Railway preferred stock, declared that more than 30 per cent of this stock had already been surrendered and that deposits of large blocks are assured. Approximately 50 per cent of the bonds of the Indianapolis Traction & Terminal Company have been deposited. Plans for the reorganization of the railway and the sale of its properties to two new corporations with approximately $9,700,000 of new money for rehabilitation being supplied by the Midland United Company, an Insull organization, were announced in the ELECTRIC RAILWAY JOURNAL NEWS for Oct. 11.

More Time for Chicago Acceptance

The Chicago City Council is to consider an extension of the date before which the merged transportation company must accept the new co-ordination franchise. To this end the local transportation committee of the council has recommended that the time limit be put forward until Jan. 31, 1931. The date set in the ordinance is Oct. 31, but it was agreed that the consolidation could not be effected by that time. The date proposed on behalf of the companies is between March 10 and 15 of next year. Representatives of every class of security except one have agreed to the merger. This exception is the representatives of the capital stock of the Chicago Railways, the west and north side surface lines, now in the hands of receivers, thus adding a technical complication but one not expected to militate against the consummation of the plan.

LATE NEWS

(*Continued from Page 715*)

Decatur, Ill.—The Illinois Commerce Commission has authorized the Illinois Power & Light Corporation to supplant the last of its street cars in Jacksonville with bus service, and has on file an application of the company for permission to make a similar change of service over four routes in Decatur.

✦

Columbus, Ohio—Tracks, cars and substation generator equipment of the Scioto Valley Traction Company have been purchased by the Joseph Schonthal Company, Columbus. There is, in all, 75 miles of track, extending from Columbus to Chillicothe, and from Columbus to Lancaster. Service over the line has already been withdrawn.

✦

New York, N. Y.—Continuance of the hearings on the proposed removal of the Sixth Avenue elevated line of the Manhattan Railway has been postponed to Nov. 3 by the Transit Commission.

✦

Newark, N. J.—Public Service Coordinated Transport, suffered a net loss from operations for first nine months of 1930 of $1,757,289, against profit in same period of 1929 of $305,832, E. A. Tuson, general auditor of company testified before Board of Public Utility Commissioners.

✦

Indianapolis, Ind.—Authority to spend $42,200 for track improvements at two major downtown street intersections in Indianapolis has been granted the receiver of the Indianapolis Street Railway Company by Judge Chamberlain of the Marion Circuit Court. At the same time, the court approved expenditures totaling $255,500 for other track improvements made during recent months. The court stipulated that all such improvements be made out of the current revenue, being opposed to the issuance of receiver's certificates.

✦

New York, N. Y.—Progress on the construction of the city's new subway lines, especially on the shops and yards at 207th Street, reported as 97 per cent complete, appear to insure the opening of the main line of the system under Eighth Avenue in Manhattan in the early Fall of 1931. Initial operation on this line is to be from Fulton and Church Streets to 207th Street.

✦

Erie, Pa.—The Erie Railways plans to substitute bus for trolley service between Erie and Wesleyville, through its subsidiary, the Erie Coach Company, if the Public Service Commission approves.

✦

Dallas, Tex.—Of the $1,373,000 set aside by the Dallas Railway & Terminal Company for the extension and improvement of its property for the current year, $605,000 will be spent in constructing a new viaduct across Trinity River. This work was started recently in accord with an agreement made with the city seventeen years ago. Included in the improvement program were track re-arrangements, purchase of seventeen new cars, the rebuilding of fourteen old cars and the paving of right-of-way on several streets.

The Business Outlook

FUNDAMENTAL though blind forces of human needs are again slowly laying the basis for future recovery since consumption eats steadily into supplies as industrial production lags. Even in building there are clear signs of revival in residential construction. Commodity prices in recent weeks have tended to hold up against the deflation process still under way in securities. As these particular forces become more apparent, business is realizing the necessity of aggressive individual action from the bottom.—*The Business Week.*

Boston, Mass.—Railway and bus fares were reduced materially on Oct. 26 in Reading, Wakefield, Andover, Wilmington and Tewksbury by the Eastern Massachusetts Street Railway. The fares situation in those towns had become unsatisfactory because the zoning system created a number of overlapping fare districts resulting in double fares over some short runs.

✦

Brooklyn, N. Y.—The Transit Commission's service bureau, after a check, reported that while the Brooklyn & Queens Transit Corporation had added more cars when it changed service on the Graham Avenue line from two-man to one-man operation, there were long intervals at times between cars. The cars used in the change were remodeled Brooklyn City Railroad cars, equipped with all required safety devices, but they did not have the treadle step and turnstile fare collector to speed up loading and unloading. This lack is blamed by experts for failure of the one-man system to succeed on this line, one of eight included in the wholesale application of the corporation for conversion to the one-man type last summer.

"Don't Forget, You Pick Up Both of Them"



Memphis Commercial Appeal

Chicago, Ill.—The Government has filed suit to restrain or enjoin the Chicago, North Shore & Milwaukee Railroad from further issuing of securities without first applying for authority from the Interstate Commerce Commission. The petition was filed by Assistant United States District Attorney Joseph A. Struett in United States District Court and alleges that since June 8, 1923, the railroad has issued $42,000,000 in securities without first obtaining consent of the I.C.C. Federal against state authority is at issue.

✦

Dallas, Tex.—Removal of tracks of the Dallas Railway & Terminal Company on South Akard Street and substitution of bus service at the regular car fare has been decided upon by city officials. The Akard line has long been a drag on the rest of the system.

✦

New York, N. Y.—Resolutions expressing opposition to the continuance of the Delaney plan of financing construction of the new city subway system has been adopted by the Merchants Association and also by a group of leaders in several civic organizations, meeting at the Chamber of Commerce of the State of New York. The resolutions urged that the present method of financing the subway work by short-term securities be discontinued and that a policy of issuing long-term bonds be adopted instead.

✦

Hartford, Conn.—The Connecticut Company has been authorized by the Public Utilities Commission to operate bus service in part in substitution for trolley service between Bloomfield and Hartford. Limited trolley service will be afforded residents of Rockwell's Corner on the Blue Hills Avenue line.

✦

St. Louis, Mo.—The St. Louis Public Service Company is installing electric heaters on its cars as quickly as the financial condition of the company will permit. At the present time about 70 cars on the system are so heated. In its final report, the St. Louis transportation survey commission recommended that 800 new cars, electrically heated, be bought, and that the remaining cars on the St. Louis system be equipped with electric heaters as part of the work to be done by the company under a proposed new franchise deal.

✦

Lowell, Mass.—The Eastern Massachusetts Street Railway plans complete substitution of buses for all trolley lines here. No major track replacements will be attempted, trolleys on some lines to be used only through the remaining life of the rails.

✦

Warren, Pa.—The West Ridge Transportation Company, which nearly a year ago acquired the Warren Street Railway, discontinued operation of trolleys on Oct. 18. Buses have been placed in service on former trolley routes and a number of new routes have been established. In starting the bus service, the company carried passengers free of charge the first two days. The Warren Street Railway began operations in 1893. In 1903 interests identified with it formed the Warren & Jamestown Street Railway to operate between Warren, Pa., and Jamestown, N. Y. On Dec. 3, 1929, buses of the West Ridge Transportation Company supplanted the interurban railway service.

Weekly Pass in Portland, Ore.

Weekly passes, to be sold for $1.25 and to be good for any number of rides by any holder, will be instituted by the Pacific Northwest Public Service Company at Portland, Ore., on Nov. 1, or as soon thereafter as details can be arranged. Decision to adopt this change was reached on Oct. 18 at a conference of railway officials with the Oregon Public Service Commission.

The change is to be made at the request of the commission as an experiment. The new rate will be in effect until the close of the year. If the pass system by that time has popularized street car riding enough to increase the company's revenues it will be continued.

A 10-cent cash fare has been in effect since March 6.

Segregation of the railway lines has been a matter of discussion for some time.

Association Affairs Reviewed

(*Continued from page 715*)

Gordon was formally authorized to serve as secretary of this committee. Professor Hirshfeld, chief engineer of the presidents' conference committee, was presented to the members of the executive committee.

President J. H. Hanna presented the annual company award in ELECTRIC RAILWAY JOURNAL Maintenance Contest to Col.



Another Trophy for the Cleveland Railway

J. H. Alexander, president of the Cleveland Railway. Ordinarily this presentation would have been made at the annual convention of the association, but this year the convention was held prior to the conclusion of the contest. In accepting the award, Colonel Alexander expressed his gratification at the success of the Cleveland Railway.

After luncheon, the members of the executive committee heard Hawley Simpson, research engineer A.E.R.A., tell about the growth of the use of private automobiles in the United States. Charts showed that the rate of increase has been arrested. He predicted that the effect of the private automobile upon public transportation had reached its maximum and that this form of competition was unlikely to become more serious in the future than it has been in the past.

Nov. 21 was tentatively selected as the next date for a meeting of the executive committee.

Mid-West Association Plans Equipment Men's Division

A FORWARD-LOOKING step of considerable interest featured the eighth annual meeting of the Mid-West Electric Railway Association held in Miami, Okla., Oct. 9, 10 and 11, when, without a dissenting voice, it was decided to organize within the association an equipment men's division where mechanical department employees could foregather semi-annually for a detailed discussion and comparison of the equipment performance records of their respective railway properties.

Particular attention, also, was paid to the subject of modern mass transportation vehicles. The trolley bus, especially, came in for a great deal of discussion. Pointing out that the trolley bus is not a new development; that 30 years ago it was in use in Europe, and some ten years ago was introduced to North America, F. M. Peters, Chicago district manager, transportation department, General Electric Company, presented two moving picture reels showing the operation of the Salt Lake City and the more recent Chicago trolley bus installations.

H. S. Robertson, presiding over the Thursday and Friday sessions, called attention to the unprecedented competition which many businesses, other than the electric railways, face. Changing conditions may make it necessary, he said, to revise financial structures of existing railway properties; to effect alterations in physical layouts by abandonments, reroutings, new equipment, co-ordination of bus and trolley bus operations, and revision of schedules and headways. In fact, Mr. Robertson concluded, research and study alone must determine what is best suited to meet the situation.

In discussing factors vital to the satisfactory operation of electric railways in cities of 85,000 population and less, F. J. Johnson, railway engineer St. Joseph Railway, Light, Heat & Power Company, stressed modernization, including not only the operation of up-to-date equipment, but also a modern financial structure, modern rates, a modern franchise, and modern service. Equally important, Mr. Johnson urged, was the need for an intensive merchandising. Finally, he urged a careful analysis of operating expenses to the end that economies in numerous small items might be made sufficient to spell the difference between profit and loss.

The Hon. John E. Curtiss, former chairman of the Nebraska State Railway Commission, defended the regulatory commissions, but declared that the interests of the people were generally best served when enlightened managements were allowed a comparatively free hand in working out solutions to the perplexing problems confronting the utilities.

In a paper prepared by S. B. Cooper, manager, general engineering department, Westinghouse Electric & Manufacturing Company, George Gillespie, Kansas City representative of the company, reviewed the progress which has been made in developing equipment for present-day operating requirements.

Claim settlements and the defense of lawsuits were subjects covered by A. T. Bagley, general claims assistant Kansas City Public Service Company. Mr. Bagley reviewed the campaign his own company has been conducting for several months against the practices of "ambulance chasing" lawyers. The change in claim policy has been directed toward cutting down the number of lawsuits, and contemplates, determining if it is not cheaper to dispose of all doubtful liability claims immediately.

In a paper dealing with the solicitation of claims, G. T. Hellmuth, general claims attorney Chicago, North Shore & Milwaukee Railroad, stressed the avoidance of accidents through the more careful selection of trainmen. "Having once chosen our trainmen," continued Mr. Hellmuth, "the next problem is that of training them. We all know how to train new men—at least I assume that we are all readers of *Aera*, ELECTRIC RAILWAY JOURNAL, and the proceedings of the American Electric Railway Association, all of which in the last two or three years have devoted considerable attention to the subject." A third requisite, concluded the speaker, is supervision — constant observation and rigid enforcement of discipline.

As an interesting feature of the first day's session, a first aid demonstration was staged by a five-man team of the Northeast Oklahoma Railroad.

A business session concluded the working program. C. A. Semrad, general manager St. Joseph Railway, Light, Heat & Power Company, was elected president for the forthcoming year; R. P. Woods, Kansas City, Clay County & St. Joseph Railway, was elected first vice-president; and C. W. Gifford, general manager, Des Moines Railway, was elected second vice-president.

Five-Cent Fare to Be Restored in New Jersey

A straight 5-cent community fare on trolley and bus will be restored in New Jersey as soon as mechanical changes can be made in fare boxes. So Thomas N. McCarter, president of the Public Service Co-ordinated Transport, informed the State Board of Public Utilities Commission on Oct. 23. The cash fare now is 10 cents with ten tokens sold for 50 cents.

In a letter to the commissioners Mr. McCarter said:

> If the ownership of Transport stood by itself without association with other properties compliance would be economically impossible, but as is well known, Public Service Corporation of New Jersey is the sole owner of the equity of Transport as it is of Public Service Electric & Gas Company, which serves substantially the same portions of the state. It is also well known that despite the difficulties of Transport, Public Service Corporation as a whole is in sound economic condition and though not a utility in the strict sense of the term it is of the highest consequence that it, as the owner of all these properties, should be adequately maintained. In trying out this arrangement we think Public Service is making a substantial contribution to help existing conditions locally. It will be our effort to contribute our share in the development of the state by rendering adequate service in all three of these major utilities. In agreeing to this advanced step we beseech for Transport a continuance of the co-operation of the board, fair treatment by the municipalities and the good will of the public.

Electric Railways Win Bus Maintenance Awards

Winners of the national awards given annually to operating companies in the bus industry by *Bus Transportation*, a McGraw-Hill publication, were announced on Sept. 26 in connection with the fourth annual meeting of the National Association of Motor Bus Operators in Chicago. The winners are: In Class A, for companies operating 3,500,000 or more bus-miles annually in revenue service: first award, United Electric Railways, Providence, R. I.; second award, Community Traction Company, Toledo, Ohio.

In Class B, for companies operating 1,000,000 and less than 3,500,000 bus-miles in revenue service: first award, Blue Ridge Transportation Company, of Hagerstown, Md.; second award, Washington Rapid Transit Company, Washington, D. C.

In class C, for companies operating less than 1,000,000 bus-miles annually in revenue service: first award, Groton & Stonington Traction Company, New London, Conn. There was no second award in Class C.

The awards were given this year for the most outstanding examples of progress made in maintenance methods and practices for vehicles operated by motor carriers in the United States and Canada. In all, there are six awards, divided among three classes of companies operating in either city or intercity service. In each classification, the first award is a medal plaque and a certificate, together with the sum of $500 in money. Second prize in each group takes the form of a medal plaque and a certificate.

What's in *News of the Industry*

A.E.R.A. executive committee meets.

Prospects good for appointment of committee on car financing.

Progress reported on Indianapolis reorganization.

More time likely for acceptance of new Chicago grant.

Full service by bus eventually in Lowell.

"Don't Forget, You Pick Up Both of Them."

Portland to try the weekly pass.

Stirring meeting of Mid-West men.

Five-cent fares back in Jersey.

A national institute of traffic engineers.

Mortality laws applied to physical property.

Car riding craze in London.

London again discusses co-ordination.

Winners of bus maintenance awards announced.

Richey's review shows economic trends.

Conspectus of Indexes for October, 1930

Compiled for Publication in ELECTRIC RAILWAY JOURNAL by

ALBERT S. RICHEY

Electric Railway Engineer, Worcester, Mass.

	Latest	Month Ago	Year Ago	Last Five Years	
				High	Low
Street Railway Fares* 1913 = 4.84	Oct., 1930 **8.01**	Sept., 1930 **7.99**	Oct., 1929 **7.76**	Oct., 1930 **8.01**	Nov., 1925 **7.30**
Electric Railway Materials* 1913 = 100	Oct., 1930 **132.7**	Sept., 1930 **133.0**	Oct., 1929 **145.6**	Dec., 1926 **159.2**	Oct., 1930 **132.7**
Electric Railway Wages* 1913 = 100	Oct., 1930 **231.8**	Sept., 1930 **231.8**	Oct., 1929 **231.1**	Oct., 1930 **231.8**	Oct., 1925 **222.8**
Electric Ry. Construction Cost Am. Elec. Ry. Assn. 1913 = 100	Oct., 1930 **195.1**	Sept., 1930 **195.6**	Oct., 1929 **203.0**	Nov., 1928 **205.7**	Oct., 1930 **195.1**
General Construction Cost Eng'g News-Record 1913 = 100	Oct., 1930 **198.7**	Sept., 1930 **199.6**	Oct., 1929 **206.3**	Jan., 1927 **211.5**	Oct., 1930 **198.7**
Wholesale Commodities U. S. Bur. Lab. Stat. 1926 = 100	Sept., 1930 **84.2**	Aug., 1930 **84.0**	Sept., 1929 **97.5**	Nov., 1925 **104.5**	July, 1930 **84.0**
Wholesale Commodities Bradstreet 1913 = 9.21	Oct., 1930 **10.30**	Sept., 1930 **10.42**	Oct., 1929 **12.70**	Dec., 1925 **14.41**	Oct., 1930 **10.30**
Retail Food U. S. Bur. Labor Stat. 1913 = 100	Sept., 1930 **145.6**	Aug., 1930 **143.7**	Sept., 1929 **160.8**	Nov., 1925 **167.1**	Aug., 1930 **143.7**
Cost of Living Nat. Ind. Conf. Bd. 1914 = 100	Sept., 1930 **152.9**	Aug., 1930 **151.6**	Sept., 1929 **163.2**	Nov., 1925 **171.8**	Aug., 1930 **151.6**
Industrial Activity Elec. World, kw.-hr. used 1923-25 = 100	Sept., 1930 **110.7**	Aug., 1930 **105.3**	Sept., 1929 **135.8**	Feb., 1929 **140.4**	Sept., 1925 **98.1**
Bank Clearings Outside N. Y. City 1926 = 100	Sept., 1930 **82.7**	Aug., 1930 **86.9**	Sept., 1929 **109.8**	Oct., 1929 **111.8**	Sept., 1930 **82.7**
Business Failures Number	Sept., 1930 1763	Aug., 1930 1630	Sept., 1929 1318	June, 1930 1874	Sept., 1928 1348
Liabilities, Millions of Dollars	**56.56**	**57.06**	**27.75**	**114.40**	**23.13**

*The three index numbers marked with an asterisk are computed by Mr. Richey, as follows: Fares index is average street railway fare in all United States cities with a population of 50,000 or over except New York City, and weighted according to population. Street Railway Materials index is relative average price of materials (including fuel) used in street railway operation and maintenance, weighted according to average use of such materials. Wages index is relative average maximum hourly wage of motormen, conductors and operators on 136 of the largest street and interurban railways operated in the United States, weighted according to the number of such men employed on these roads.

BOOK REVIEWS

Development of Oil Circuit Breakers

"High Voltage Oil Circuit Breakers," by Roy Wilkins, consulting engineer Pacific Electric Manufacturing Company and E. A. Crellin, assistant engineer Pacific Gas & Electric Company, with an introduction by J. P. Jollyman. 301 pages, 119 illustrations. Published by the McGraw-Hill Book Company, New York, 1930. $4.

In this volume is given a complete history of the development of the high voltage oil circuit breaker, a discussion of the theory of its action, descriptions of modern forms, and an account of the results of many field tests.

Electrical Distribution

"Electrical Distribution Engineering," by Howard P. Seelye, Engineering Division, Detroit Edison Company. 710 pages, illustrated with 394 diagrams. McGraw-Hill Book Company, New York, 1930. $6.

This book is a comprehensive treatment of electrical distribution system design, including essentials of electrical and civil engineering and economics necessary to a knowledge of the subject. The principles are shown in their relation to the solution of practical problems. Many tables and data for reference are included.

A Technical Dictionary in Three Languages

Techno-Dictionary, English-German-Italian. 410 pages 4x6 in. Published by Hubert Hermanns, Berlin-Lichterfelde, Germany. $3.75.

For the readers of foreign technical periodicals the author has compiled this dictionary, which is a collection of technical terms for metallurgical, foundry, factory and workshop practice. There are three separate sections for the three languages translated. Following the word in the language of the section are given the definitions in the other two languages. No attempt is made to make this a general translation dictionary, but the author has endeavored to collect the largest possible number of terms as found in reading foreign technical periodicals and books. Approximately 4,000 to 5,000 words are translated from each of the three languages into the other two.

Mortality Laws Applied to Physical Property

"Life Expectancy of Physical Property Based on Mortality Laws," by Edwin B. Kurtz, head of department of electrical engineering State University of Iowa. Published by the Ronald Press Company, New York. 205 pages, 90 charts, 60 tables. $6.

While depreciation of physical property has, from time to time, been considered as a mathematical problem and formulas have been presented, it is seldom that the subject has been attacked from a scientific basis. In this book the author has applied to the life problems of physical property—structures, machinery, equipment, etc., the principles and methods which have been used by life insurance actuaries in dealing with the problems of human mortality. The author has collected an immense amount of material and has drawn off life experience of many engineering structures as a basis for determing a logical method of anticipating life of property.

Unified Public Control for London Transport Services

THE British transport minister, Herbert Morrison, has recently met in successive conference representatives of the various transport organizations serving London and suburbs including the London General Omnibus Company, the London Underground Railway, the Metropolitan Railway, the various municipal railway organizations, and the four main-line railroads of Britain. It is intended to proceed at once to open discussions following a study undertaken by Sir William McLintock, famous accountant.

Co-ordination of the undertakings engaged in passenger transport in the London district has been recommended in varying forms by successive commissions and committees, notably the London and Home Counties traffic committee in 1927. When he assumed office this subject formed one of Mr. Morrison's first preoccupations.

In a statement made in the House of Commons some time ago, he outlined the Government's ideas for dealing with the London traffic question. The sum and substance of Mr. Morrison's statement amounts to this:

No lasting solution will be found unless further steps are taken towards eliminating uneconomic and unnecessary competition. A far-reaching measure of unification under public control is essential. The object must be to bring about, so far as possible, a co-ordinated system of passenger transport so managed that earnings shall be sufficient to meet all proper charges, including reasonable remuneration of capital. The Government has concluded that the ends in view can be fully achieved and that the public interest can be fully safeguarded only if existing sectional financial interests are consolidated by the substitution of a single and simple form of public ownership. The Government will proceed to explore with all the interests concerned and with the assistance of an eminent chartered accountant, a plan for the complete consolidation on fair and equitable terms of the agencies now providing services by omnibuses, by tramways and by local railways. All the municipal interests should be included. While the Government has decided that the principle of public ownership should be applied, its aim will be to assert and effectively to provide for the principal of commercial management of a self-supporting consolidated transport system. In this way no liability need be entailed on public funds or public credit.

In planning the transfer of these transport services to public ownership the Government is not taking a leap in the dark. Already Parliament has recognized the necessity in many cases of entrusting essential national or local services to public bodies of this nature, such as the Port of London Authority, the Metropolitan Water Board, and the Central Electricity Board.

Mr. Morrison started with a bias in favor of a joint municipal body representative of the local authorities in the area, but in the end he concluded that this would be inappropriate. Further, his own experience of serving on local authorities showed him that there was too much "joint" and not enough "authority" about them.

The Government, therefore, aims at combining business-like management with public ownership by the creation of a small board consisting of persons of proved business capacity. Every effort will be made to secure the services of a chairman who combines business acumen and vigor with wide knowledge and experience, and who can be trusted to ensure that the appointment of officers of the board will be governed by considerations of efficiency. The board will be such as will command the confidence both of the investing public and of the users of transport in London. It will function as much as possible free from political interference so far as questions of management are concerned.

Mr. Morrison is anxious to utilize the experience and abilities which exist in the present undertakings, and it is likely that Lord Ashfield, charman of the London Underground combine, will be offered the chairmanship of the board.

The new authority's transport policy will be determined by technical fact and public interest. In this connection, it is interesting to note that, upon its advent to office, the present Government was successful in securing the rejection of the merger, under private control, of the Underground Railways, London General Omnibus Company, and the London County Council Tramways, which was on the point of receiving Parliamentary sanction.

The capital of the London traffic undertakings totals £113,052,023 ($565,260,115). The board will become responsible for services on which last year 4,000,000,000 journeys were made. The returns of passengers in 1929 in the Greater London area gave the following totals:

	Number	Per Cent
Tube railways.....	961,978,475	24.4
Street railways.....	1,076,250,997	27.3
Buses	1,912,092,980	48.3

The aggregate represented an increase of 51,195,852, compared with 1928. The London General Omnibus Company operates a fleet of 4,600 vehicles. It is closely linked with the London Underground combine.

No Material Changes Recommended for Liverpool

Fourteen months ago, Sir Henry Maybury was requested by the corporation to investigate and report upon traffic conditions in Liverpool with particular reference to the respective merits of street cars and buses. The most interesting of Sir Henry's conclusions is his vindication of the street railway system, which covers 167 miles and which he regards as "an excellent investment, capable of serving the Liverpool public extremely well for many years and of earning large sums of money for the rate-payers." Since the improvement of the cars has not kept pace with the maintenance of the track and with the demand for increased comfort and travel, Sir Henry suggests introduction of bogie cars capable of a much higher speed. In London, he declares, the maintenance of a higher standard of comfort and efficiency has enabled street railways to increase their traffic, and he predicts a similar result in Liverpool, if the rolling stock is modernized without delay. Sir Henry also says the cost of operating a well-organized and well-managed railway amid a considerable potential traveling population is probably lower per seat-mile than is the case with any other passenger vehicle, save perhaps the trolley bus. Nevertheless, he believes future needs should be met by augmenting the bus fleet. He is opposed to the construction of a subway system in Liverpool and sees no benefit from the suggestion for linking up the street railways with the Liverpool Overhead Railway.

A Remarkable Recovery at Glasgow

The statement of accounts of Glasgow Corporation Tramways for the year ended May 31 shows a wonderful improvement in finances. In former years this was a highly prosperous system, but for some time back it has recorded deficits owing to keen and growing bus competition. For the year ended May 31, 1929, there was a deficit of £85,222. This has now, for the twelve months ended May last, been changed to a surplus of £8,136. The deficit and surplus are arrived at after charging, in addition to working expenses, interest on capital, sinking fund, large allowances for renewals and depreciation, and other deductions.

It is to be noted that the last-mentioned allowances are about £70,000 less than those for the year before. Despite that, however, the traffic receipts are up £33,000. The improved revenue is largely attributed to the adoption of more comfortable cars equipped with more powerful motors giving higher car speed. The system generally has been tuned up. The city authorities have recently obtained powers to restrict unlimited bus competition, and if a bill which they now have before Parliament is passed, the municipality will obtain a monopoly of public passenger transport over tramway routes within the city. The corporation is also rapidly developing its own bus services.

New Light-Weight Cars Tested in Birmingham

Birmingham is experimenting with all three forms of transport. A few months ago, buses of the roomy, luxurious type, recently introduced in London, replaced a rail service, while in another district the trackless trolley has superseded the railway. Birmingham still has a strong street railway system under the control of the municipal corporation, the transport department of which is now testing out two new street cars of a lighter type than hitherto operated. By the use of duralumin and aluminum parts in construction a considerable reduction has been effected in the weight of the cars and operation has been cheapened. Transverse and reversible seating in leather and moquette is provided for 60 passengers.

London Catches the Car Riding Craze

The American freak cult of "tree-sitting" has a parallel in London, where travelers are car-riding for freak records. The craze has sprung up as a result of the popularity of the London County Council system's "shilling-all-day" tickets, which entitle the passenger to ride as often and wherever he wishes on any Council street car. The endurance record is at present held by James Kardux. With an all-day ticket he traveled 183½ miles in 21 hours 20 minutes. He rode in 57 street cars, starting at 5:20 a.m. and finishing late on the next day. His longest trip in one car was 30 miles. The ordinary fares would have totaled $2.87, whereas his shilling (24-cent) ticket defrayed the entire cost. Mr. Kardux broke a previous record of 175 miles.

PERSONAL MENTION

Messrs. Ingle and Moore Advanced in Jacksonville

Officials of Florida Company Advanced in Recognition of Their Long and Valuable Services. Mr. Ingle at Jacksonville Since 1922

JOHN P. INGLE, manager of the Jacksonville Traction Company, Jacksonville, Fla., has been made president of the company, and B. H. Moore, assistant treasurer, has been named treasurer. The new president will remain manager, and the company will follow its present operating policies. Mr. Ingle succeeded Donald C. Barnes, of Boston, as president. Mr. Moore's predecessor was Henry B. Sawyer, also of Boston. No other changes in the personnel of the company were made.

Mr. Ingle has been manager of the company since 1922, when he went to Jacksonville from Haverhill, Mass. Mr. Moore went to Jacksonville in March, 1928, from Boston, where he had been attached to the auditing division of Stone & Webster, Inc., operators of the Jacksonville railway system.

Every once in a while an editor finds that his work has been done for him by some one else. The occasions are infrequent, but such instances do occur. The present is one of them. If ever a man was bisected and dissected then John P. Ingle is so treated in the following accurate appraisal of the man, culled from a source not clearly identified but none the less accurate:

> Even the radical chaps who hate public service corporations as inventions of the devil designed solely to steal the rights of the people and directed by men who are two-thirds Machiavelli and one-third Mussolini admit that John P. Ingle is a regular fellow.
>
> Urbane and smiling always, whether in friendly intercourse or forensic tilt, he is as ready to plunge instantly into defense of a cause of a friend as he is to strike lusty blows in pushing his own battles. The sobriquet "happy warrior" might well be borrowed and fitted to this manager of the Jacksonville Traction Company.
>
> Few men in Jacksonville have engaged in such gusty controversies as John P. Ingle. None other has left behind so little personal bitterness and so few personal enemies.
>
> John P. Ingle has a genius for fighting hard and long for a cause, an issue or an ideal without letting the struggle descend to personalities. He manages to be charmingly inoffensive and friendly even when his carefully marshalled logic is destroying his opponent's case.
>
> Because of his limitless tact and his ability, he has the affectionate personal regard even of those who oppose in principle the interests he represents. This public impression of the man is only one facet of his character, but it reflects traits that appear again in other phases of his business activity.
>
> If you want to know about a man, ask his relatives or his employees. If you want to know about John P. Ingle, ask the employees of the Jacksonville Traction Company. Ask in a friendly way, too, because there's a fair chance you'll find trouble if you act as though you don't like him. The answer to your question will warm the cockles of your heart with its enthusiastic, hearty man-affection for a regular fellow.

John Pierce Ingle was born in Salisbury, Md., in October, 1882. He spent his boyhood in Atlanta and attended the public schools of that city. Ambitious to study engineering, he entered the Georgia School of Technology and was graduated in 1906 as a bachelor of science in civil engineering.

On leaving school he at once became associated with Stone & Webster, Inc. His first major assignment was to the assistant superintendency of the Columbus Gas Company, Columbus, Ga.

His talents for making friends and solving difficult public utility problems soon won him recognition and he was promoted again, this time to the superintendency of the gas department of the Baton Rouge, La., Electric Company.



J. P. Ingle

His next step was to Keokuk, Iowa, as manager of the Keokuk Electric Company. Then he was transferred to Haverhill, Mass., as manager of the Haverhill Gas Light Company. In July, 1922, Mr. Ingle was sent to Jacksonville as manager. Just now the company of which he is the head is negotiating with the city for a new franchise.

J. S. Thorp in New Lackawanna Post

James S. Thorp, since September, 1928, electric traction engineer of the Delaware, Lackawanna & Western Railroad, has been appointed electrical engineer of that company. Previously he was assistant electrical engineer on the Illinois Central electrification. Mr. Thorp has had wide experience in steam and electric railway service. He has been connected with the electrification of the New Haven, the Norfolk & Western and the Victorian Railways of Australia. He was graduated from Virginia Polytechnic Institute in mechanical and electrical engineering, class of 1910.

Appointments Presage Intensive Traffic Development

Announcement of the appointment of E. B. Smith as general freight and passenger agent, and W. R. Hickrod as superintendent of transportation, and the placing in effect of new schedule in the interest of improved freight transportation has been made by E. L. Moore, general superintendent of the Evansville & Ohio Valley Railway, operating railway and bus lines at Evansville, Ind.

Mr. Smith assumes the post of general freight and passenger agent after four years with the Chicago & Eastern Illinois Railroad freight department. A native of Evansville, he was formerly with Servel, Inc., traffic department, and as road representative of the Fisk Tire & Rubber company.

Mr. Hickrod, has spent the greater part of his business years in Evansville & Ohio Valley service. Starting in as conductor in 1905, he served in this capacity for eight years. Up to his most recent promotion to superintendent of transportation, he had operated the dispatcher's office since 1913.

The company has established freight pick-up trucking service between Evansville and Mount Vernon, Ind., insuring daily deliveries of merchandise. Orders will be received from merchants in Mount Vernon for merchandise from Evansville supply centers, and store door deliveries will be made, Mr. Moore stated.

Store door freight delivery service has also been started between Evansville and Rockport. Orders for merchandise will be received by the agent at that point. Package express convenience is now available on all cars and buses in both directions at moderate transportation rates.

E. J. Booth Is Made Assistant to President

Edwin J. Booth has been elected assistant to the president of the Chicago, South Shore & South Bend Railroad, South Bend, Ind., according to announcement by Robert M. Feustel, president. Mr. Booth has also been elected assistant to the executive vice-president of the Midland United Company, of which he also is comptroller.

J. H. Pritchard Manager at Lynchburg

J. H. Pritchard, of Chicago, has been appointed manager of Lynchburg Traction & Light Company, Lynchburg, Va., to succeed C. D. Thomas, resigned. Mr. Pritchard will arrive in Lynchburg about Nov. 1. He is a native of eastern Virginia and a graduate of Virginia Polytechnic Institute, where he majored in engineering. He is working at present in the headquarters office of the Central Public Service Company in Chicago which controls the Lynchburg property. At one time he was an engineer for a utility company in St. Joseph, Mo.

Mr. Thomas was manager of Lynchburg Traction & Light Company a little more than one year, taking the place of D. C. Frost at the time of the latter's death. He was assistant to Mr. Frost for several months before being appointed manager.

G. M. Dahl Now Factor in Interborough Affairs

ELECTION of Gerhard M. Dahl, chairman of the Brooklyn-Manhattan Transit Corporation, as chairman of the board and of the executive committee of the Interborough Rapid Transit Company, took place early last month. In effect, it makes Mr. Dahl the dominant figure in the city's transit affairs. In addition to



G. M. Dahl

his positions in B.-M. T. and I. R. T., Mr. Dahl also is chairman of the Brooklyn & Queens Transit Corporation, controlled by the B.-M. T., and also heads the Brooklyn Bus Corporation, bus operating subsidiary of the B. & Q. T.

As representative of the Interborough, appointed by the directorate, Mr. Dahl will take part in unification conferences with the city transit authorities. As head of the B.-M. T., he already controls the destinies of that company in unification. For several months Mayor Walker's transit advisers have been discussing a basis for fixing a price to be offered the B.-M.T.

Mr. Dahl and Samuel Untermyer, special counsel for the city in transit matters, already have discussed possibility of forming a quasi-public holding company to take over securities of the two independent companies and operate a unified system, including the city's new lines, scheduled to be ready in the fall of 1931.

Appointment of Mr. Dahl to represent the Interborough in unification discussions also was regarded as a significant development. As the *Wall Street Journal* has pointed out, Interborough management, up to this time, has refused consistently to take part in unification negotiations on the grounds that it could not until its increased fare suits were acted on finally by the courts.

The make-up of the Interborough executive committee indicates the strength of the Dahl group in the company's affairs. On the committee, in addition to Mr. Dahl, are Charles Hayden and Albert H. Wiggin, both of whom were members of the protective committee, formed last March to bring the Interborough into the unification picture. Both Mr. Hayden and Mr. Wiggin also are on the B.-M. T. directorate. Other members of the committee favor unification.

It also is interesting to note that four members of the Interborough executive committee are directors of the Chase National Bank. Frank L. Folk, who is a voting trustee of the Interborough, with Mr. Dahl and Frank Hedley, is also a director of the bank.

Mr. Dahl has had an unusual record of achievement as a lawyer, as an executive and as a financier.

Memorial Fountain for Late M. L. Harry

Formal dedication of the M. L. Harry memorial fountain at Decatur, Ill., was made on Sept. 6. The fountain was a gift to the city by a group of friends of the late M. L. Harry, who felt that the memory of a man who had meant so much to the community in which he lived deserved to be preserved by some tangible token. To present this worthy memorial, this group of friends selected L. E. Fischer, vice-president in charge of operations of North American Light & Power Company, a life-long friend of Mr. Harry's. In a brief impressive presentation talk, Mr. Fischer paid a just tribute to Mr. Harry and explained in behalf of those who made this monument possible, the occasion for the ceremony.

M. L. Harry lived in Decatur for a quarter of a century. His death, as the result of an unfortunate accident, occurred on Oct. 11, 1929, while he was on duty for the Illinois Power & Light Corporation by which he was employed, and in the service of humanity that he loved so much.

Messrs. Burns, Plummer and Brown in New Dallas Posts



W. R. Burns

W. R. BURNS, who has been assistant general manager of the Dallas Railway & Terminal Company, Dallas, Tex., for several years, has been elected vice-president and appointed general manager of the company. He succeeds the late Richard Meriwether. Other appointments announced include that of George I. Plummer and B. R. Brown as assistant general managers in charge of traffic and engineering and construction, respectively. A statement by President John W. Carpenter of the company, in which he eulogized the work of the men who are advanced, says:



B. R. Brown

The company takes pride in being able to fill the top positions in the organization with men who have developed from the ranks. This has been the policy pursued for several years and it has built a spirit of loyalty that has made the local railway system efficient despite decreased patronage and lowered income. This policy will continue and there will always be opportunity for present and future young men employees. This will insure good service to Dallas patrons. In the final analysis, this is what the people are entitled to and which we strive to supply.

Mr. Burns has been closely connected with the operations of the company for



G. I. Plummer

many years. His experience with the company and his previous public service work fit him admirably to be general manager. He has an intimate knowledge of the operating history of the company and has made a close study of its problems. He started in the offices of the Dallas company fifteen years ago as clerk in the accounting department. Several years later he was made assistant secretary-treasurer and subsequently was made assistant general manager. Mr. Burns was born on a farm in Cooke County, near Gainesville. He went to East Texas State Teachers' College at Commerce after he finished at the Cooke County schools.

Mr. Plummer has been with the Dallas

company for 24 years. His first job was at the carhouse. He has worked all through the ranks in the traffic department and has seen the Dallas system grow from belt lines to one of the most efficient systems in the country.

Mr. Brown entered the engineering department of the company 21 years ago and has directed construction work on many of the present lines. He has been in charge of the track and line department for many years.

C. D. Emmons, New Hudson & Manhattan Head, Is Honored

One hundred and fifty business executives prominently identified with transportation and associated industries, honored Charles D. Emmons, recently elected president of the Hudson & Manhattan Railroad, operating between New York and New



C. D. Emmons

Jersey under the Hudson River, at a testimonial dinner tendered him on Thursday evening, Oct. 16, at the Lotos Club, New York.

Arthur Brisbane, well known journalist, who contributes the department "Today" to the Hearst papers, was the principal speaker. Others who spoke included Matthew C. Brush, J. H. Hanna, president, Capitol Traction Company, Washington, D. C., and Charles J. Hardy, general counsel, American Car & Foundry Company. Charles C. Castle, vice-president of the American Car & Foundry Company, was toastmaster.

The committee in charge of arrangements for the dinner included: George Le Boutillier, vice-president Pennsylvania Railroad; Matthew C. Brush, president International Corporation; Charles R. Ellicott, vice-president Westinghouse Air Brake Company; Frank Hedley, president Interborough Rapid Transit Company; Frederick Green, Triplex Safety Glass Company; H. Hobart Porter, director B.-M.T. and Hudson & Manhattan Railroad; Charles F. Scott, General Electric Company; Lucius S. Storrs, president United Railways & Electric Company of Baltimore, and William H. Woodin, president American Car & Foundry Company.

Among those who attended the dinner were:

H. H. Vreeland, I.R.T.; W. S. Menden, Brooklyn-Manhattan Transit Corporation; G. W. Jones, Brooklyn-Queens Transit Corporation; W. T. Rossell, Brooklyn-Queens Transit Corporation; F. T. Wood, Fifth Avenue Coach Company; L. H. Palmer, Fifth Avenue Coach Company; H. B. Potter, United Railways & Electric Company, Baltimore; Guy C. Hecker, American Electric Railway Association.

J. V. Davies, Hudson & Manhattan Railroad; C. E. Morgan, Cincinnati Car Corporation; E. C. Faber, of Barron G. Collier Company; F. H. Shepard, Westinghouse Electric & Manufacturing Company; T. R. Langan, Westinghouse Electric & Manufacturing Company; W. M. Wampler, Elicon Company; E. B. Smith, American Brake Shoe & Foundry Company; T. W. Casey, National Pneumatic Company; C. S. Hawley, Consolidated Car Heating Company; S. J. Cotsworth, Lorain Steel Company; C. B. Keyes, General Electric Company; J. G. Barry, General Electric Company; C. A. Melvin, Griffin Wheel Company; C. S. Klumpp, Hudson & Manhattan Railroad; T. A. Kenney, Allied Engineers, Inc.; C. B. Buchanan; R. P. Stevens; W. J. Stanton; H. B. Flowers; W. A. Lake, Pantasote Company; Ross Hayes, of Adams & Westlake Company; Adrian Hughes, Jr., United Railways & Electric Company, Baltimore; E. P. Waller, General Electric Company; J. A. Queeney, Philadelphia Rapid Transit Company; J. A. Miller, Jr., ELECTRIC RAILWAY JOURNAL; W. G. Gove, Brooklyn-Queens Transit Corporation.

Mr. Emmons, guest of honor, was born in Lafayette, Ind. He was graduated from the University of Pittsburgh in 1892 with the degree of civil engineer. For nine years he was connected with the maintenance of way and signal departments of the Pennsylvania Railroad. During the past 30 years he has been actively associated with the development of transportation in several large American cities, serving as president of the Boston & Worcester Street Railway; president of the Boston Elevated Railway and president of the United Railway & Electric Company, Baltimore. He became president of the Hudson & Manhattan Railroad on Oct. 1, 1930, upon the retirement of Oren Root.

A. E. Reynolds Now at St. John

A. E. Reynolds, for eight years vice-president and general manager of the Springfield Gas & Electric Company and the Springfield Traction Company, Springfield, Mo., has been transferred to St. John, New Brunswick, as vice-president and general manager of the New Brunswick Power Company. The St. John Company and the Springfield Companies are subsidiaries of the Federal Light & Traction Company, New York, of which E. N. Sanderson is president.

Mr. Reynolds entered public utility work in Plattsburgh, N. Y., finally being appointed manager of the Plattsburgh Traction Company. After the purchase of this road by the Delaware & Hudson Company, Mr. Reynolds was transferred to Glens Falls, N. Y., as resident manager of the Hudson Valley Railway. He remained in Glens Falls eight years and was then elected general manager of the United Traction Company, serving the capital district, with office in Albany. He resigned this position in 1922 to become associated with the Federal Light & Traction Company and was immediately sent to Springfield, Mo.

Mr. Reynolds has been highly honored in the electric railway and public utility field in Missouri, being past-president of the Mid-West Electric Railway Association and past-president of the Missouri Association of Public Utilities. In Springfield, Mr. Reynolds was connected with many civic clubs and organizations.

Mr. and Mrs. Reynolds left Springfield the middle of October for St. John.

T. E. Thomas Runs London's Municipal Trams

T. E. Thomas, traffic manager in the London County Council Tramways Department, was recently appointed general manager of the undertaking succeeding J. K. Bruce, who retired on June 30. Mr. Thomas, is 48 years of age. He entered the Council's service in 1917, being selected from 38 candidates who applied in response to public advertisements for the position of development superintendent in the traffic branch of the tramways. In 1925 he was appointed traffic manager. Mr. Thomas commenced his tramway career in 1899, when he entered the service of the London United Tramways, Ltd., under the late Sir Clifton Robinson. He was appointed district engineer of the Surrey lines of that company in 1910, and later transferred to the staff of the Underground Group of companies. He became commercial superintendent of that group of companies after the absorption of the London General Omnibus Company. He was awarded the gold medal of the Institute of Transport in 1927, and has been a member of the Council of the Tramways, Light Railways, and



T. E. Thomas

Transport Association since 1927. On taking the post he said it would be his constant endeavor to justify the confidence which had been reposed in him.

A. E. Francis Promoted in San Francisco

A. E. Francis, since 1928 superintendent of ferry terminals for the Market Street Railway, San Francisco, Cal., has been named superintendent of the company's Geneva division, succeeding the late Byron F. Dunn. The division is one of the largest of the system, operating lines in the Mission and Ingleside districts and the San Mateo interurban cars. Mr. Francis began his career as a conductor 27 years ago in the Potrero district. Later he became a motorman and then an inspector, a position he held until his appointment as superintendent of ferry terminals. His successor in that position is G. W. Evington, who has been an inspector since 1915. He formerly was a conductor, also.

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Earl F. Theisinger has been made associate editor of *Bus Transportation*, a McGraw-Hill publications. He joined the staff in 1925, writing for departments devoted to maintenance, and shop practices and methods. In 1927 he was made an assistant editor.

H. F. Dicke, Lehigh Official, Heads Pennsylvanians

Henry F. Dicke, vice-president in charge of operation of the Lehigh Valley Transit Company, Allentown, Pa., since 1926, has been elected president of the Pennsylvania



H. F. Dicke

Street Railway Association. For eight years before joining the Allentown company in 1925 as assistant to the president, Mr. Dicke was general manager of the Utah Light & Traction Company, Salt Lake City, Utah. At the time he went to Allentown from Salt Lake City, Mr. Dicke also was made vice-president of the East Penn Electric Company, Pottsville, and vice-president of the Williamsport Passenger Railway.

Mr. Dicke is a native of Fort Wayne, Ind. In 1899 he entered the service of the Fort Wayne Traction Company in the accounting department, where he served for a period of five years. He resigned that position to become general auditor of the Ohio & Indiana Construction Company. This company was formed to build a 65-mile line from Fort Wayne to Lima, Ohio. During this construction work Mr. Dicke devoted some time to the engineering department and became superintendent of construction. When the work was completed he was placed in charge of operation of the property owned by the Fort Wayne, Van Wert & Lima Traction Company, which later, with several other properties, merged with the Ohio Electric Railway.

For seven years he had charge of operation of the northern division of the Ohio Electric Railway, consisting of 242 miles of interurban lines, and then resigned to go to Boise, Idaho, as general manager of the Boise Valley Traction Company. He served in this capacity for five years, and was then made general manager of the Utah Light & Traction Company at Salt Lake City, which position he relinquished to take up his duties with the Pennsylvania companies.

L. B. Herrington Heads Union Transfer

L. B. Herrington, president of the Kentucky Traction & Terminal Company, the Kentucky Utilities Company, Louisville, Ky., and subsidiary companies, including the Consolidated Coach Corporation, which was taken over a few months ago, has also been made president of the Union Transfer Company, Nashville, Tenn., controlling interest in the Union Company having been purchased by the Insull interests, for Consolidated Coach Corporation, which operates in Kentucky and Tennessee. Still more recently Consolidated Coach has bought into the Alabama Bus Company and the Capital Coaches, Inc., giving Consolidated 5,000 miles of route and 350 buses.

The Union Transfer Company maintains general offices at Nashville. It operates buses between Nashville and Birmingham, Ala.; Nashville and Hopkinsville, Ky.; Nashville and Knoxville; Nashville and Chattanooga; and Nashville and Florence, Ala., with numerous feeder lines. The Consolidated has gradually linked up practically all of the worthwhile lines in Kentucky, and has been gradually adding to its Tennessee holdings. The Insull interests also hold a considerable amount of stock in the Old Dominion lines and others.

Other than Mr. Herrington, new officers of Union are about the same as for Consolidated. C. R. Quarles, treasurer and general manager of Union, became a member of the board, and assistant secretary-treasurer. J. P. Pope, vice-president of the Kentucky Traction & Terminal Company, and Guy A. Huguelet, Lexington, Ky., are vice-presidents of both companies; A. A. Tuttle, Louisville, secretary-treasurer both companies; L. W. Haley, P. Pherigo and G. C. Jones, all of Lexington, assistant treasurers.

Frank H. Miller on Louisville Executive Committee

Frank H. Miller, vice-president and general manager of the Louisville Railway, Louisville, Ky., on Oct. 15, was elected a director of the company, and a member of the executive committee, succeeding John W. Barr, Jr., who resigned several months ago.

Messrs. Fleming and Weber in New Offices in Chicago



H. B. Fleming

AS NOTED briefly in ELECTRIC RAILWAY JOURNAL for October, the Chicago City Railway, the Calumet & South Chicago Railway, and the Southern Street Railway have elected Harvey B. Fleming president and chairman of the board of directors, succeeding the late Leonard A. Busby. To succeed Mr. Fleming in the position of vice-president of the south side companies, Harry P. Weber, Mr. Busby's law partner, has been chosen vice-president and general counsel.

Mr. Fleming also has been elected a member of the board of operation of the Chicago Surface Lines, a member of the executive committee of that board and of the Chicago City & Connecting Railways collateral trust committee.

Ever since he was placed in charge of tracks, buildings and electrical work for the Chicago City Railway Company in 1899 Mr. Fleming has been associated with city railway operation in Chicago. He was educated in the public schools of Newburgh, N. Y., Newburgh Academy, and Washington University, St. Louis, Mo., from which latter institution he received the degrees of bachelor of science and civil engineer. He is a member of the Sigma Alpha Epsilon fraternity.

Prior to the completion of his education, Mr. Fleming was employed by the T. M. Marvel Company, shipbuilders in Newburgh, and after he was graduated from Washington University, he was appointed assistant engineer of the St. Louis Water Works Department. His first street railway experience was as engineer for the National Street Railway Lines, of St. Louis.

He became chief engineer of the Chicago City Railway in 1905, and since that time has served in various capacities, being elected director and vice-president of the Chicago City Railway in 1912 and appointed chief engineer of the Chicago Surface Lines in 1914 when the surface railways of Chicago were unified and the Surface Lines organization was created. He has been a member of the board of supervising engineers ever since that board was created by ordinance in 1907, representing the so-called South Side lines.



H. P. Weber

Mr. Fleming is also president and chairman of the board of directors of the Hammond, Whiting & East Chicago Railway and the Chicago & Western Railway.

Melvin A. Traylor, president of the First National Bank; James Winston and Harry P. Weber have been elected directors to fill vacancies caused by the deaths of Frank O. Wetmore and Leonard A. Busby and by the resignation of Frank W. Thomas.

Redistribution of Duties on Indiana Railroad

HENRY BUCHER, vice-president and general manager of the Indiana Railroad, has announced the appointment of three new trainmasters with responsibilities that supersede the duties of division superintendents, which titles have been abolished. The trainmasters will report to C. C. Lentz, superintendent of transportation.

Arthur Hartgrove, formerly superintendent of the Tipton division of the Union Traction Company, has been made trainmaster in charge of interurban operations on lines between Indianapolis, Muncie and Bluffton, and between Indianapolis, Newcastle and Muncie, succeeding A. R. Manifold, former division superintendent. His headquarters will be at Muncie.

N. K. Smith, formerly division superintendent of the Fort Wayne-Lima Railroad, Fort Wayne, Ind., is appointed trainmaster with supervision over interurban operations between Indianapolis and Peru (Tipton division), Anderson and Marion, and Tipton and Alexandria. Mr. Smith's headquarters will be at Kokomo.

M. F. Strahan will be trainmaster at Indianapolis in charge of interurban operations on all lines between the Indianapolis terminal and immediate suburban territory. He will also have supervision over the Indiana Railroad's interurban buses, connecting Indianapolis, Anderson and Marion.

Mr. Bucher also named two new superintendents of city lines, who will report to J. A. Greenland, general superintendent of transportation—city lines.

C. J. Stanley, with headquarters at Anderson, will have charge of all city street car and bus operations in Anderson and Muncie.

S. R. Humbert, with headquarters at Kokomo, will have charge of city operations in Marion and also of local cars and buses of the Northern Indiana Power Company in Kokomo. The Northern Indiana Power Company's transportation lines are operated under the same co-ordinated management as the Indiana Railroad. E. K. Grimes, formerly superintendent of the Marion city lines, has been transferred to the transportation department at Indianapolis.

Glenn H. Shaw Heads Safety Council's Railway Section

Glenn H. Shaw, personnel and safety director, Akron division, Ohio Edison Company, was elected general chairman of the electric railway section of the National Safety Council, at the recent meeting in Pittsburgh, to succeed Melvin W. Bridges. To his work as a safety director Mr. Shaw brings a background of practical experience as an operator, earnestness of purpose and enthusiasm for his subject. His work with the Ohio Edison Company has contributed in no small measure to the success of that company in combating the accident menace.

In January, 1920, Mr. Shaw went to work for the Cleveland Railway as trainman. A few months later he was singled out for promotion to the position of traffic inspector, and shortly thereafter was made a safety inspector in the company's newly organized accident prevention department. He continued in this capacity until December, 1922, when he went with the Northern Ohio Power & Light Company, Akron division, as personnel and safety director, continuing in this position when the company was recently reorganized as the Ohio Edison Company.

Born on Feb. 8, 1885, at West Almond, Alleghany County, N. Y., Mr. Shaw attended grade schools near the place of his birth, and later completed a course at Wilson Academy, Angelica, N. Y. He entered the service of the Schenectady Railway as conductor in 1906 where he remained until 1910, when he took a position as trainman with the Albany Southern Railroad, a high-speed third rail system between Albany and Hudson, N. Y.

H. F. Merker in Construction Work in St. Louis

H. F. Merker, as president of Merker & Company, St. Louis, Mo., is now engaged in carrying out two large construction contracts in that city. One has to do with the work of preparing the old terminal of the Illinois Traction System at Twelfth and Lucas Avenue for the St. Louis Electric Terminal Railway. The other has to do with the preparation of the site at High, Twelfth, Franklin and Wash Streets for the *Globe-Democrat's* new building. The building contractor in each instance is the Fruin-Colnon Company.



H. F. Merker

Mr. Merker is indirectly associated with the Illinois Power & Light Corporation and the Missouri Rolling Mills Company. It was from the Missouri Rolling Mills Company that he went to Brooklyn in 1923 as engineer of maintenance of way and structures of the Brooklyn surface system. From 1905 to 1919 he was engineer of maintenance of way of the East St. Louis & Suburban Railway. He has been active as an engineer since his graduation from the University of Illinois in 1898.

Activities of W. H. Sawyer Widened

Willits H. Sawyer, formerly president of Stevens & Wood, Inc., has moved his office as executive engineer to 120 Broadway, New York City, where he will also be associated with R. P. Stevens & Company, Inc. In addition to his consulting activities in connection with the management problems of public utilities, Mr. Sawyer will give an appreciable part of his time to the duties required by his recent appointment as co-receiver of the Atlantic Public Service Associates, Inc. He will also continue as receiver for the Springfield Railway, Springfield, Ohio.

Frank Couzens and S. D. Waldon on Detroit Board

Frank Couzens, dismissed by former Mayor Bowles, has been reappointed by Mayor Murphy, of Detroit, Mich., to a place on the Street Railway Commission. He fills the vacancy made by the resignation of Frank Dohaney, appointed by Mr. Bowles. It is understood that Commissioner Couzens will become practically directing head of the system of the Department of Street Railways. He is to have his office in the railway administration building and will devote much of his time to the direction of the department. The post brings no remuneration.

Mr. Couzens is a son of former Mayor James Couzens under whose régime as Mayor of Detroit the municipal system was founded. He was first appointed to the commission in 1929 by John Lodge, then Mayor, but was dismissed by Mayor Bowles last April presumably because he refused to see eye-to-eye with the then Mayor on municipal railway problems.

Charles W. Burton has also resigned from the commission. He has been replaced by Sidney D. Waldon, president of the Rapid Transit Commission. Mr. Burton was appointed to the commission by Mr. Bowles after the recall election of July 22.

Mr. Waldon will continue to act as a member of the Rapid Transit Commission. Mr. Waldon was on the Detroit Street Railway Commission for one year, in 1919, before he became a member of the Rapid Transit Commission.

Mayor Murphy was disposed to merge the two commissions, but Mr. Waldon pointed out that the powers of the two commissions are dissimilar. The Legislature can repeal the rapid transit act, but it cannot amend the charter of Detroit. The work of the two commissions will now be more closely co-ordinated, but the two bodies will retain their separate powers.

English Publisher Visits United States

Among the delegates to the International Roads Congress, held recently in Washington, D. C., is Horace Wyatt, director *Motor Transport* and *Bus and Coach*, published in London. Mr. Wyatt has since made the tour of cities proposed for the delegates, and now intends to visit in New York, Cleveland, Boston, Toledo, Toronto, Montreal and other cities to study the operation of both buses and trucks. He arrived in the United States on Oct. 6 and will leave for home from Quebec on Nov. 14.

✦

B. A. Hinkley, formerly chief inspector, has been promoted to acting superintendent of the Springfield Traction Company, Springfield, Mo., to fill

the vacancy caused by the death on Sept. 10 of Charles A. Coons, assistant general manager. Mr. Hinkley started his career with the Springfield system in 1904 as a motorman. He was made chief inspector four years ago.

✦

John E. Davis has resigned as manager of the public relations-public information department of the Kentucky Utilities Company, Louisville, Ky., to take charge of the public utilities promotion work of the Whitney-Graham Company, Buffalo, N. Y. Mr. Davis has had charge of advertising and publicity for the company since Oct. 15, 1924, and has been director of public relations for the last two and one-half years.

✦

John A. Seymour, auditor, has been elected president of the Chicago Rapid Transit Company, Section No. 6, A.E.R.A., for the ensuing year. Mr. Seymour succeeds George E. Tebbetts, engineer of structures, who had served in this capacity since last October.

✦

Charles J. McMorrow, supervisor of service for the Springfield Street Railway, Springfield, Mass., for the last ten years and for 24 years an employee of the company, has resigned to become sales manager for a real estate company in Springfield.

✦

William F. Allen, advertising manager for the St. Louis Public Service Company, St. Louis, Mo., has been appointed to the publicity committee of the ninth annual community fund campaign scheduled for Nov. 10 to 20. He will have charge of public utilities advertising.

✦

Robert H. Mangum, formerly assistant manager of the investment department, has been named manager of the publicity department of the Alabama Power Company. He succeeds W. J. Baldwin, who has been appointed publicity manager for the Commonwealth & Southern Corporation. Mr. Mangum has been connected with the power company since 1927.

✦

R. A. Stephen, formerly assistant treasurer of the Commonwealth & Southern Corporation, has been elected treasurer. B. W. Eggert and F. A. Bain have been elected assistant treasurers.

✦

Harvey C. Couch, president of the Louisiana Power & Light Company, New Orleans, La., and an officer of other companies included in Electric Power & Light Company group, has been elected a director of the St. Louis-San Francisco Railway, filling the vacancy caused by the resignation of Leonard Adkins. Mr. Couch has also been appointed a member of the executive committee, succeeding Eugene V. R. Thayer, resigned.

✦

Fred L. Markham, sales manager American Car Company, St. Louis, resigned his position with the Brill organization on Oct. 1.

✦

Charles S. Kimball, past president of the American Electric Railway Engineering Association and at present connected with the Portland Cement Association, has been appointed chairman of the committee of the Washington Society of Engineers which is to investigate the drainage and surfacing of air ports.

OBITUARY

E. W. Bemis

Edward Webster Bemis, economist and public utilities expert, died on Sept. 25 in Springfield, Mo. Mr. Bemis suffered a general breakdown last winter.

From 1901 to 1909 Mr. Bemis was superintendent of the Water Department at Cleveland, Ohio. He went to New York in January, 1910, as deputy commissioner of water supply, gas and electricity, holding that position until October. Since then he had been a consulting engineer for cities, states and public utility bodies. From 1913 to 1923 he was a member of the advisory board of the valuation bureau, Interstate Commerce Commission. Mr. Bemis wrote extensively on public utility topics.

Mr. Bemis was born in Springfield, Mass., on April 7, 1860, and was graduated from Amherst College in 1880, receiving his A.M. degree there four years later. Johns Hopkins University conferred the Ph.D. degree upon him in 1885. From 1889 to 1892 he was professor of history and political economy at Vanderbilt University. For the next three years he was associate professor of political economy at the University of Chicago. He became assistant statistician of the Illinois Bureau of Labor Statistics in 1896, and from 1897 to 1899 was Professor of Economics and History at the Kansas State Agricultural College.

✦

P. Van Burington

Philander Van Burington, former secretary and treasurer of the Columbus Railway, Power & Light Company, Columbus, Ohio, died on Oct. 8. Mr. Burington retired five years ago after an association of 34 years with the Columbus utility. He was at one time auditor and fiscal agent. Before becoming associated with the Columbus company, Mr. Burington was general freight agent for the old Scioto Valley Railroad, now a part of the Norfolk & Western Railroad. He was 83 years of age.

✦

Charles A. Coons

Charles A. Coons, assistant general manager of Springfield Traction Company, Springfield, Mo., who died on Sept. 10, had long been engaged in electric railway work. For 25 years he was superintendent of the International Railway, Buffalo, N. Y., and for 13 years was general superintendent of the United Traction Company at Albany, N. Y. He was born in Watertown, N. Y., in 1867. He went to Springfield to assume the duties of assistant general manager of the company there in the early part of 1928.

✦

W. W. Arnheim

William Walter Arnheim, president of Marks Arnheim, Inc., men's clothiers, of New York, died suddenly on Oct. 5 of heart disease at his country home at Elberon, N. J.

Mr. Arnheim was not an operating street railway official, but he was a pioneer in the movement for traffic reform. He was one of the first to recognize the extreme seriousness of New York's traffic problem, and with unflagging enthusiasm, combined with the knowledge of an expert, he set out to find a solution. It must have been a source of much satisfaction to him to have witnessed, long before his untimely end, the practical operation of some of the reforms he so long and consistently advocated. ELECTRIC RAILWAY JOURNAL differed with Mr. Arnheim on some of the things he suggested, but it respected the man for his zeal.

Mr. Arnheim was born in Cincinnati 49 years ago. He served on the Mayor's committee of plan and survey and as chairman of the traffic committee of the Broadway Association, and had written many articles on New York's traffic problems, for which he from time to time, offered his own solutions.

✦

P. J. Pringle

P. J. Pringle, chief engineer and general manager of the Electric Supply Company of Victoria, Ltd., Australia, died recently at Zurich, Switzerland, while he was proceeding on a holiday visit to England. He formerly occupied various important positions in electrical engineering and consulting work. His last appointment in England was that of borough electrical engineer and tramway manager at Burton-on-Trent.

✦

W. H. Harton

William H. Harton, 57 years of age, general manager of the Cincinnati, Newport & Covington Railway, died on Sept. 16 at Fort Mitchell, near Covington, Ky. Mr. Harton started with the company 38 years ago as an engineer, becoming general manager following the death of James P. Ernst. He was president of the Kentucky Association of Public Utilities, in 1924; and was re-elected to the post at a meeting in Louisville in January, 1929. There was no meeting of the association in 1930. Mr. Harton was well known throughout Kentucky and in Southern Ohio among utility operators.

✦

G. S. Amidon

George S. Amidon, an employee of the United Electric Railways, Providence, R. I., for 44 years, died on Oct. 8. During his service he had been superintendent of the Riverside, Olneyville and East Providence divisions. At the time of his death he was employed at the North Main street carhouse. He entered the employ of the railway at the age of 21, as a conductor, and was successively starter, inspector and superintendent. Mr. Amidon was born in Springfield, Mass., 66 years ago.

✦

William B. Cutter, one of the organizers of the Buffalo-Depew Railway, now part of the interurban lines of the International Railway, Buffalo, N. Y., is dead. He was born in Buffalo on Dec. 14, 1853, and was a pioneer in the development of real estate in the suburban districts adjacent to Buffalo. The railway was organized in 1898. About ten years ago Mr. Cutter retired from active business.

INDUSTRY MARKET AND TRADE NEWS

Lackawanna Railroad Gets Switching Locomotive

In connection with the suburban electrification out of Hoboken, the Delaware, Lackawanna & Western Railroad some time ago ordered two electric locomotives. These are for transfer service between the Jersey City yards and the Secaucus and Harrison yards and also for switching in these yards. The first of the locomotives was recently shipped from the Erie Works of the General Electric Company. These locomotives are of the "three-power" type, capable of operating from the 3,000-volt trolley, from an oil engine or from a storage battery.

The locomotive is of the double-truck box-cab type with four direct geared, direct current box frame series motors, designed to run two in series on 3,000 volts. A 300-hp. Ingersoll-Rand oil engine, direct connected to a 750-volt d.c. generator furnishes an auxiliary source of power. There is also a storage battery of 360 Type MVA-21 Exide ironclad cells.

In the electric zone the motors operate continuously from the 3,000-volt d.c. trolley. Outside the electric zone the engine-generator set charges the storage battery and supplies power to the traction motors. Current is furnished to the motors at 600 to 700 volts. At light loads the excess power of the engine charges the battery; at loads above 300 hp. the battery discharges and relieves the engine from overload. Auxiliaries operate from the storage battery. Increased tractive effort at the higher speeds is obtained on internal power by shunting approximately 50 per cent of the field current through a non-inductive resistance. The single unit Type PCL control is non-automatic. By means of contactors and transfer relays, the trolley and battery circuits are interlocked so that traction motors can be energized from only one of these sources at a time.

The total weight of the locomotive, with fuel, water and sand, is 124 tons, and the maximum tractive effort at starting is 60,000 lb. The maximum permissible speed is 40 m.p.h. Length inside knuckles is 47 ft. 10 in. Locomotive, in running order, weighs 248,000 lb.; all weight is on driving axles.



One of two switching locomotives for the Lackawanna Railroad. These run on the 3,000-volt overhead, storage battery or on oil-electric power



New type of double-end car delivered for service on the Lehigh Valley Transit

New Cars Placed in Service by Lehigh Valley Transit

Ten new cars have been recently delivered by J. G. Brill to the Lehigh Valley Transit Company, of Allentown, Pa., for service on the Allentown-Bethlehem loop. Many changes with respect to the old type of equipment have been incorporated in these cars. They are lighter, weighing 37,320 as compared with 42,000 lb., and attain a higher speed. Acceleration can be controlled by either hand or foot operation New types of springs and shock absorbers have made possible low body lines. Total seating capacity of each car is 48 passengers. Detailed specifications as follows:

Name of railway	Lehigh Valley Transit Company, Allentown, Pa.
Number of units	10
Type of unit	Two-man, motor, passenger, city, double end, double truck
Number of seats	48
Builder of car body	J. G. Brill Co., Philadelphia, Pa.
Date of order	March 26, 1930
Date of delivery	Oct. 2, 1930
Weights:	
Car body	17,920 lb.
Trucks	9,900 lb.
Equipment	9,500 lb.
Total	37,320 lb.
Bolster centers	22 ft. 5 in.
Length over all	45 ft. 10 in.
Length over body posts	32 ft. 5 in.
Truck wheelbase	5 ft. 4 in.
Width over all	8 ft. 4 in.
Height, rail to trolley base	10 ft. 10 in.
Window post spacing	36½ in.
Body	All steel
Roof	Arch
Doors	End



Interior of car has an enamel finish and linoleum flooring

Air brakes	Westinghouse SME
Alarm gong	E.S.S. Co's pneumatic
Armature bearings	Plain
Axles	Hammered steel
Car signal system	Faraday buzzers
Compressors	General Electric Co.-CP-27
Conduit	Flexible
Control	Westinghouse VA
Couplers	Portable bar
Destination signs	Keystone
Door mechanism	National pneumatic
Doors	Folding
Finish	Beckwith Chandler enamel
Floor covering	Armstrong linoleum
Gears and pinions	Nuttall
Glass	Plate in vestibule
Hand brakes	Peacock staffless
Heaters	Consolidated
Headlights	Electric Service Golden Glow
Headlining	Agasote
Interior trim	Statuary bronze
Journal bearings	Plain
Journal boxes	Brill semi-steel
Lamp fixtures	E. S. S. No. 27902
Motors	Westinghouse 510-E No. 4, inside hung
Painting scheme	Red
Registers	International R-12 double
Roof type	Arch
Roof material	Wood
Sanders	Ohio Brass
Sash fixtures	O. M. Edwards
Seats	Brill 201-B
Seat spacing	31 in.
Seating material	Deep buff taxi grain leather
Slack adjusters	Brill mechanical
Steps	Stationary
Step treads	Kass
Trolley retrievers	Earll
Trolley base	U. S. 24-A
Trolley wheels	More-Jones
Trucks	Brill 177-E1
Ventilators	Brill
Wheels, type	Rolled steel 26 in. diameter
Wheelguards	HB type lifeguards
Window cleaner	Brill

Okonite Company, manufacturer of insulated wires and cables, announces the appointment of Theodore T. Kennedy as district manager of its Los Angeles office.

Knoxville, Tenn., Gets New Cars



One of the ten new cars recently delivered to Knoxville Power & Light Company, Knoxville, Tenn., by Perley A. Thomas Car Works. The cars are equipped with pneumatically operated doors, green plush seats and aisle flooring of hard maple wood strips. The car weighs complete 32,500 lb.

Armco Creates Railroad Division for Sales Promotion

American Rolling Mill Company has organized a new division of its sales forces, which will be known as the railroad division. This division will combine the handling of wrought steel wheels, iron and steel sheets and various other products. The headquarters will be at the general offices in Middletown, Ohio. Logan T. Johnston has been made manager, and H. M. Arrick, assistant manager.

Mr. Johnston was formerly with the Standard Steel Car Company, of Pittsburgh, and later assistant to the vice-president in charge of the commercial activities of the forged-steel wheel division. Mr. Arrick, before joining the Armco sales department three years ago, was associated with the operating department of the Pennsylvania Railroad.

Three district offices have already been established. W. B. Quail will manage the New York office, assisted by W. A. Dibblee and E. C. Bray. The latter will be located in the Philadelphia office. Ernest Baxter has been made manager of the Chicago district. He will continue, also, in his present capacity as vice-president of the Sheffield Steel Corporation, in charge of railroad sales. F. E. Finley has been made manager of the St. Louis district.

Bus Deliveries to Electric Railways

Deliveries of buses to electric railways have continued steadily during recent weeks, although at somewhat lower level than during previous months. Twin Coach Corporation reports that the greatest volume of sales for one month in the history of the company was recorded during September. Deliveries for that month are valued at more than $500,000, a gain of more than $100,000, or 30 per cent over the value of deliveries during September, 1929. Among the deliveries reported by Twin Coach are included twelve urban, small-capacity buses to the Pacific Electric Railway, Los Angeles, and five urban, large-capacity buses to the Boston Elevated Railway.

For the month of September, General Motors Truck Company reports the delivery of five Type W-21 Yellow Coaches to the Virginia Electric & Power Company, Richmond, Va.; five Type U-21 Yellow Coaches to the Memphis Street Railway, Memphis, Tenn.; and four Type W-21 Yellow Coaches to the Mississippi Valley Public Service Company, Milwaukee, Wis.

Deliveries by Mack-International Motor Truck Corporation are reported as three Model AB, 29-passenger buses to Jamaica Central Railways, Jamaica, N. Y., and one Model AB, 230-in. bus chassis to Utah Light & Traction Company, Salt Lake City, Utah. From A.C.F. Motors Company, Illinois Power & Light Corporation, Chicago, accepted delivery of two 25-passenger, parlor car buses, and Capital Traction Company, Washington, D. C., accepted delivery of one 33-passenger, parlor car coach. White Company delivered two Model 65A buses to Louisville Railway.

Financial Statement of G. E. for Nine-Month Period

For the nine months ended Sept. 30, General Electric Company indicates a profit available for common stock dividends of $42,518,709, equal to $1.47 per share, compared with $47,965,832, or $1.66 per share on the number of shares now outstanding last year. Comparison of the principal items in the income account for the two periods follows: Net sales billed, $287,886,541, against $301,812,809; cost of sales billed, including operating, maintenance and depreciation charges, reserves and provisions for all taxes, $254,760,877, against $263,316,462; net income from sales, $33,125,664, against $38,496,346; other income, less interest paid and sundry charges, $11,324,254, against $11,400,578; net profit available for dividends, $44,449,918, against $49,896,925; cash dividends on special stock, . $1,931,210, against $1,931,093.

Carey Elastite Patent Sustained

In a decision recently handed down by Judge Cooper in the United States District Court in the Northern District of New York, patent No. 1,171,441, under which the Philip Carey Company Elastite rail filler is manufactured, was held to be valid. The Philip Carey Manufacturing Company brought suit against Henry Dumary, an Albany contractor, and the Albany Milling Corporation, a dealer. The infringing rail filler was manufactured and the suit was defended by Serviced Products Corporation, of which Albert C. Fischer, a former employee of the Philip Carey Company, is president.

Judge Cooper's decision stated that the rail filler as manufactured under the patent in question "is a real success and a real benefit to the cities and street railway companies having the problem ever before them of repairing, paving and repaving streets containing railway tracks."

New York Central Gets 42 Electric Locomotives



Three of 42 three-power electric locomotives, ready to leave the Erie, Pa., works of the General Electric Company. The units shown above will be used for the West Side electrification of the New York Central Railroad in New York City. Power may be obtained from a third rail, from a Diesel engine and battery combined, or from the battery alone.

General Car & Coach Corporation Starts Production

Manufacture of standardized street cars and trolley buses for the General Car & Coach Corporation of Albany, N. Y., according to an announcement recently made by President O. F. Warhus, is to be done under contract by the St. Louis Car Company. The cars will be manufactured following the designs developed during the last four years and patented by Mr. Warhus.

Production will be started immediately by an organization already fully equipped with the necessary tools and machinery and with an established reputation for its own products. An advantage of this arrangement will be that no additional capital outlay will be made for equipping a new factory. This is expected to enable the General Car & Coach Corporation to place its product on the market at a particularly favorable price. Sales offices and headquarters have been established at 100 State Street, Albany, N. Y.

Advertising Literature

General Electric Company has published a 75-page booklet, "Heat-Treatment of Steel." This booklet covers briefly the heat-treatment of steel, including hardening, annealing, normalizing, casehardening and tempering. The second part is devoted to the discussion of the effects of electric heat treatment on production costs. Construction and maintenance of G. E. electric furnaces is covered in a third part.

✦

Camden Forge Company, Camden, N. J., has printed for distribution a pamphlet devoted to the discussion of equalizers, drawbars and other forgings of hammered wrought iron, carbon steels or alloy steels.

Railway Utility Company, Chicago, Ill., offers a pamphlet describing heating and ventilating equipment for electric cars, trolley buses and buses.

✦

General Electric Company has issued publication GEA-1228 describing the electrification of the Cleveland Union Terminal.

Westinghouse Sales

Net income during the first three quarters amounted to $11,355,619 after depreciation, reserves and taxes. After interest charges, the balance available for common and preferred stockholders amounted to $11,352,244, or $4.25 a share on outstanding stock of both classes as compared to $7.33 a share last year and $6.03 the year before. Balance available for dividends showed a decline over the nine months of approximately 42 per cent.

A.E.R.A.'s Golden Anniversary Convention

THE 50th, or Golden Anniversary, convention of the American Electric Railway Association will take place in the new auditorium and convention hall at Atlantic City, Sept. 26 to Oct. 2, inclusive, 1931.

In connection with the convention, the operating and manufacturer members of the association will hold the usual exhibition of appliances and other manufactured articles of interest to the managers and other important executives and operating officials of the urban and interurban transportation companies of the country.

A diagram showing exhibition spaces together with application for space will be available to the membership about May 1, 1931.

Lincoln Arc Welding Prize Competition Is Announced

Designers and engineers in every industry, where iron and steel form all or a part of the manufactured product, are again given the opportunity by the Lincoln Electric Company, Cleveland, Ohio, to show their skill and ingenuity in utilizing the advantages of arc-welded construction. There will be awards to the amount of $17,500 for the 41 best papers submitted in the competition. The papers entered in the competition will be judged by the jury of awards composed of the electrical engineering department of Ohio State University under chairmanship of Prof. Erwin E. Dreese. The purpose of this second Lincoln arc welding prize competition, as announced by its sponsors, is to stimulate designers and engineers in every line of industry to think of the manufacture of their own products by the use of arc welding and to increase their knowledge of the feasibility of its application.

Award for the first prize paper will be $7,500; for the second prize paper, $3,500; for third prize paper, $1,500; for fourth prize paper, $750; for fifth prize paper, $500; for sixth prize paper, $250, and for the seventh to the 41st prize papers, $100 each.

The competition will be open to any person in the world except the employees of the sponsors. The closing date for the competition will be Oct. 1, 1931. Other details of the rules of the competition are expected to be announced shortly.

Electric Railway Material Prices—November 1, 1930

Metals—New York

Copper, electrolytic, delivered, cents per lb.	9.50
Lead, cents per lb.	5.10
Nickel, ingot, cents per lb.	35.00
Zinc, cents per lb.	4.00
Tin, Straits, cents per lb.	25.50
Aluminum, 98 to 99 per cent, cents per lb.	23.30
Babbitt metal, warehouse, cents per lb.:	
Commercial grade	33.00
General service	30.00

Bituminous Coal

Pittsburgh mine run, net ton	$1.25
Central, Ill., screenings, f.o.b. mines	0.75
Kansas screenings, Kansas City	1.40
Big Seam, Ala., mine run	1.50

Track Materials—Pittsburgh

Standard steel rails, gross ton	$43.00
Track spikes, 9/16-in. and larger, cents per 100 lb.	2.80
Tie plates, cents per 100 lb.	2.075
Angle bars, cents per 100 lb.	2.75
Track bolts and nuts, cents per 100 lb.	3.90
Ties, white oak, Chicago, 6 in. x 8 in. x 8 ft.	1.35

Hardware—Pittsburgh

Wire nails, base, per keg	$2.05
Sheet iron (24 gage), cents per lb.	2.45
Sheet iron, galvanized (24 gage), cents per lb.	3.05
Auto body sheets (20 gage), cents per lb.	3.50

Waste—New York

Waste, wool, cents per lb.	12.00 to 15.00
Waste, cotton (100 lb. bale), cents per lb.:	
White	9.00 to 13.00
Colored	5.00 to 7.00

Paints, Putty and Glass—New York

Linseed oil (5 bbl. lots), cents per lb.	10.2
White lead in oil (100 lb. keg), cents per lb.	13.75
Turpentine (bbl. lots), per gal.	0.44
Putty, 100 lb. tins, cents per lb.	5.50

Wire—New York

Bare copper wire, cents per lb.	11.75
Rubber-covered wire, No. 14, per 1,000 ft.	4.55
Weatherproof wire base, cents per lb.	12.75

Paving Materials

Paving stone, granite, 5 in., f.o.b.:	
New York—Grade 1, per thousand	$150.00
Wood block paving 3½, 16 lb. treatment, N. Y., per sq.yd., f.o.b.	2.50
Paving brick 3½x8½x4, N. Y., per 1,000 in. carload lots, f.o.b.	50.00
Paving brick, 3x8½x4, N. Y., per 1,000 in. carload lots, f.o.b.	45.00
Crushed stone, ¾-in., carload lots, N. Y., per cu.yd., delivered	3.40
Cement, Chicago, in carload lots, without bags, f.o.b.	1.95
Gravel, ¾-in., cu.yd., delivered New York	3.40
Sand, cu.yd., delivered New York	2.15
Asphalt (Texas), in package, N. Y., per ton	22.50

Scrap Metal—New York

Heavy copper, cents per lb.	7.50
Light copper, cents per lb.	7.00
Heavy yellow brass, cents per lb.	4.50
Zinc, old scrap, cents per lb.	2.00
Lead, heavy, cents per lb.	3.75

Old Material—Chicago

Steel car axles, net ton	$15.25
Cast iron car wheels, gross ton	13.75
Steel car wheels, gross ton	15.25
Leaf springs, cut apart, gross ton	15.75
Angle bars, gross ton	13.25
Brake shoes, net ton	8.75
Rails (short), gross ton	14.25
Rails (relaying), gross ton (65 lb. and heavier)	28.50
Machine shop turnings, gross ton	5.50

TRADE NOTES

Cutler-Hammer, Inc., reports for the quarter ended Sept. 30, 1930, shipments amounting to $2,198,116, compared with $2,683,398 in the preceding quarter, and $3,321,450 in the third quarter of the previous year.

✦

Westinghouse Electric & Manufacturing Company offers a new eight-page circular describing a metal-inclosed truck-type switchgear, manually and electrically operated, built for three-phase, 60-cycle supply, 3,000 amp. maximum and 15,000 volts maximum. The circular is identified as Circular 1892.

✦

C. J. Bowers has been appointed production manager of the Lincoln Electric Company's plant in Cleveland.

✦

Ohio Brass Company has declared an extra dividend of $1 per share on the common stock, in addition to the regular quarterly dividend of $1.25 per share, both payable Oct. 15 to holders of record Sept. 30.

✦

Harold F. Kneen has been appointed plant superintendent of the Lincoln Electric Company, Cleveland, Ohio, manufacturer of "Linc-Weld" motors and "Stable-Arc" welders. Mr. Kneen, who is a graduate of Cornell University, with the degree of mechanical engineer, came to the Lincoln Electric Company as assistant plant superintendent in June, 1929.

✦

Paramount Cab Manufacturing Corporation and subsidiaries announce, for the year ended Sept. 30, a net loss of $280,912 after depreciation, interest and other charges. This loss compares with a net profit of $1,115,981, or $4.46 per share last year.

There ain't no such animal!

To date we have never heard of a man who enjoyed inroads upon new income.

None of us ever shall.

PEACOCK STAFFLESS BRAKES

are like an insurance policy, protecting against inroads upon net income and accident reserves.

No matter how badly brake shoes are worn or how loose the brake rigging is, Peacock Staffless Brakes assure certain braking power in any emergency.

The present day faster traffic demands Peacock Staffless Brakes for Safety.

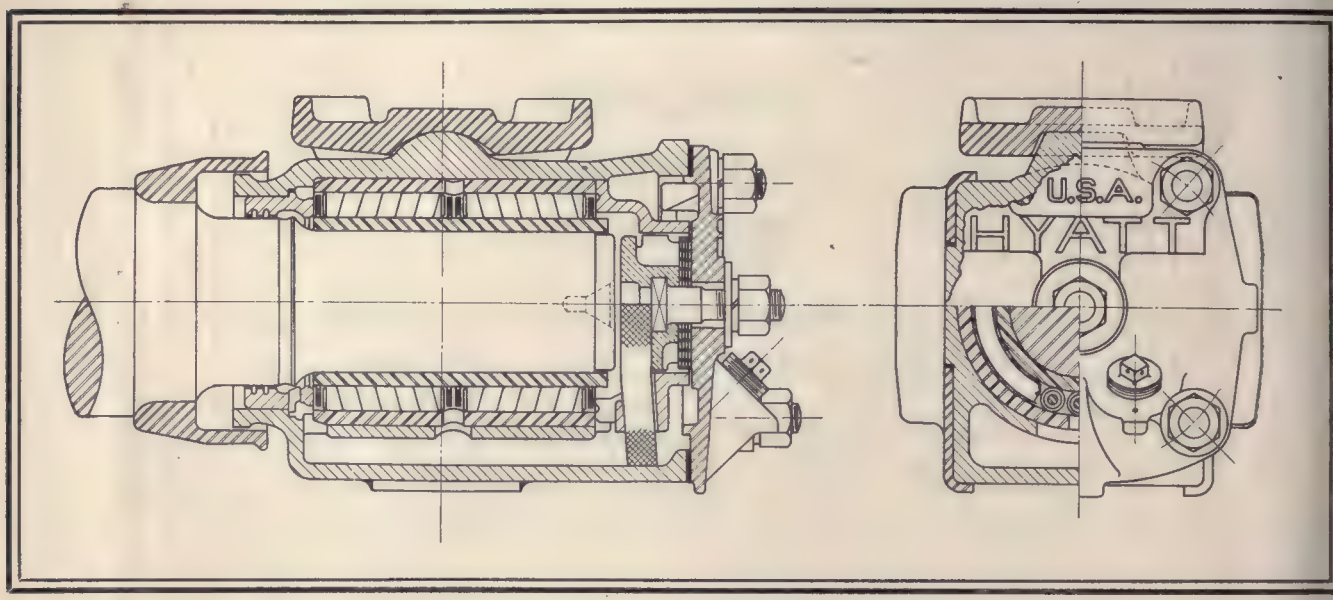


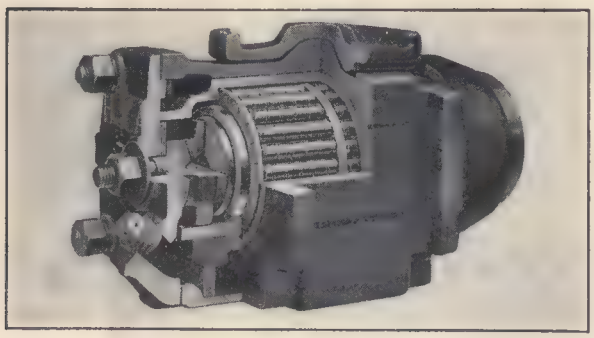
National
Brake Company, Inc.
890 Ellicott Square, Buffalo, N. Y.

Canadian Representative
Lyman Tube & Supply Co., Ltd., Montreal, Can.

...of interest to Mechanical Department Executives

Hyatt Roller Bearing Journal Boxes will eliminate the item of bearing trouble from your pull-in record and effect a considerable saving in the cost of routine maintenance. Less frequent inspection is required by a Hyatt bearing because it's practically wear





Hyatt Roller Bearing Journal Box, designed to reduce maintenance cost and to increase the riding comfort of passengers.

proof and because it uses so little oil. Replacements of bearings and stores kept for this purpose are eliminated, less lubricant is used and no packing waste.

Hyatt bearings reduce starting torque, save power and prevent damaging strains on the motor and driving gears. Consider them for your equipment, in the interest of general efficiency and economy.

HYATT ROLLER BEARING COMPANY

Newark Detroit Chicago Pittsburgh Oakland

HYATT

ROLLER BEARINGS

PRODUCT OF GENERAL MOTORS

"PERSISTENTLY . . .



More Miles Per Tire Than Any Other Make"

AFTER more than a year of thorough testing on its fleet of private cars, coaches and trucks, the Division of Municipal Transportation, City of Coral Gables, Florida, reports that "Goodyear Tires have persistently given us more miles per tire than any other make."

This is the year-in, year-out experience of coach fleet operators in every part of the country, including those in the winter-harrassed north and on the trans-desert lines of the west. Typical statements read like this: "practically no road failures in 3 years" —"nearly a quarter million miles between tire delays"—"tire costs per mile greatly reduced."



Added to these individual experiences is the great nation-wide fact that more people ride on Goodyear Tires than on any other kind. This fact is as true of motor coaches as it is of passenger cars. It is the final proof that Goodyears will give your coaches exactly what you want in tires — greater freedom from trouble and delay — maintained schedules — sure, safe traction — comfort — and consistently lower operating costs.

THE GREATEST NAME IN RUBBER

GOODYEAR

ON YOUR NEW MOTOR COACHES SPECIFY GOODYEARS

"Compression tested" installation of DAYTON TIES



Before compression test

Core taken from under street car rails—100 feet south of 6th and Main Streets, Dayton, Ohio. Note perfect condition of concrete.

After compression test

Same core after being subjected to compression of 58,560 lbs.—many times the maximum pressure ever placed on track foundation.

A recent removal of car track for overhead steam road crossing in the city of Dayton enabled us to thoroughly test the condition of the concrete in tracks that were laid under traffic in 1922. After 8 years—the concrete was found to be in perfect condition, demonstrating conclusively that "under traffic installations" have no effect on the long life of Dayton Ties.

The Dayton Mechanical Tie Co.

Dayton, Ohio

The Better Tie *without an Alibi*

cores *from under traffic reveal perfect condition*

Youngstown adopts modern methods of track construction with Dayton Ties—without interrupting traffic—low cost—a factor.

This progressive city—winner of the Coffin award—finds Dayton Ties ideally suited to track reconstruction work, with concrete foundation—without stopping traffic. "The method used is to excavate to the hollow of the concrete slab, while the track is being welded into 600 or 700 foot lengths. At night and between car movements—the old rail is thrown out and the new rail placed—with as many of the ties changed as possible. Connections are made and traffic continues uninterrupted. The ties are then changed and a 3 inch concrete slab is poured 2 inches below the bottom of the tie for the length of the track. When set, another slab of concrete is poured and the ties are tamped with a compression air tamper. Concrete is brought to the bottom of the cushion and paved. According to Youngstown, this track construction is most economical and is least inconvenient to car operation." Total labor and material cost per track foot for this construction is approximately $9.22.—"Electric Traction," August, 1930, issue.



Special work shown below—Youngstown, Ohio—laid under traffic—in 70 hours, using Dayton Ties.

"Smooth Track"



Service in Mobile is given by rolling stock maintained at a high standard. Thirteen new cars, similar to the one in the foreground, have been purchased in the past three years

Mobile Bids for Patronage with

Clean Cars, Close Headway *and* Smooth Track

By

CLIFFORD A. FAUST

Assistant Editor, *Electric Railway Journal*

The story of Mobile's thoroughly modern electric railway system was told in the September, 1930, issue of *Electric Railway Journal*.

METAL & THERMI

PITTSBURGH CHICAGO ALBANY 120 BROADWAY

4,400 THERMIT WELDS

insure permanently smooth track for Mobile, Alabama—

Thermit welding—for rails and at special work—is now standard practice on the city lines of the Mobile Light & Railroad Co. The management of this thoroughly up-to-date system has faith in the future of the electric railway. Old track is being replaced with new—and the watch-word is high grade, long-lived construction! Construction which will be trouble-proof! Construction in which the rail joints will be as smooth and as permanent as the rail itself. Over four thousand Thermit welds installed in the past few years, on a system of this size, is proof enough of their confidence in the method.

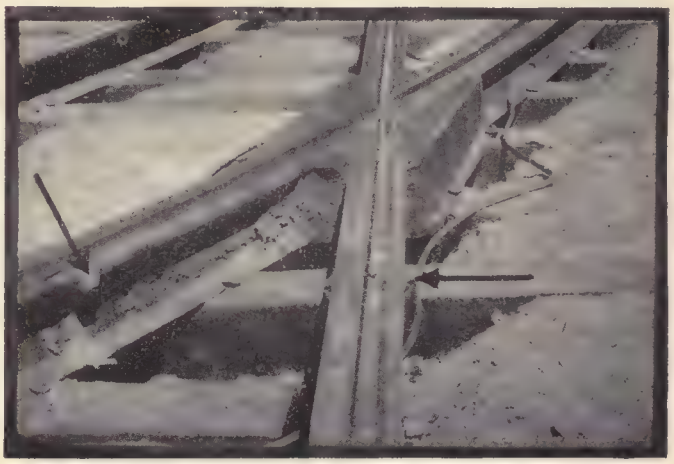
Thermit welding is a distinct economy for the small road as well as the large. Definite figures and plans will be presented without obligation.



An extensive program of track re-building during the past eight years has included a large portion of the city lines.



Grinding Thermit welds at special work joints on the street railway lines of the Mobile Light & Railroad Company.



Arrows indicate Thermit welds between frog and lead rails.

CORPORATION

EW YORK, N.Y. SOUTH SAN FRANCISCO TORONTO



THE riders of Electric Railway cars are the ultimate censors by whose rigid judgment the value of the street car card is determined. If the ultimate consumer loses his respect for advertising, it becomes valueless to the manufacturer and the space in which it is placed is no longer an asset to the company which owns it.

It is no small part of the work of the Collier organization to jealously guard the reliability of Collier Service and to see that every card that is placed in the racks of the cars is constructively helpful in maintaining street car advertising space as an asset to the operating companies.

BARRON G. COLLIER INC.

CANDLER BLD'G NEW YORK CITY



CAR CARD ADVERTISING ALMOST EVERYWHERE

GENERAL CAR AND COACH CORPORATION

OF ALBANY, N. Y.

Announces

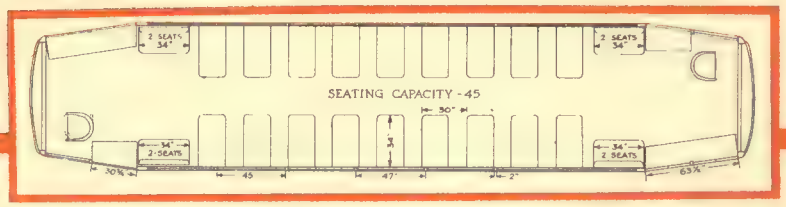
it has

selected and contracted with the St. Louis Car Company *for the manufacture of its* Standard Production Model Cars *and* Coaches



The GENERAL CAR AND COACH CORPORATION • • • • •

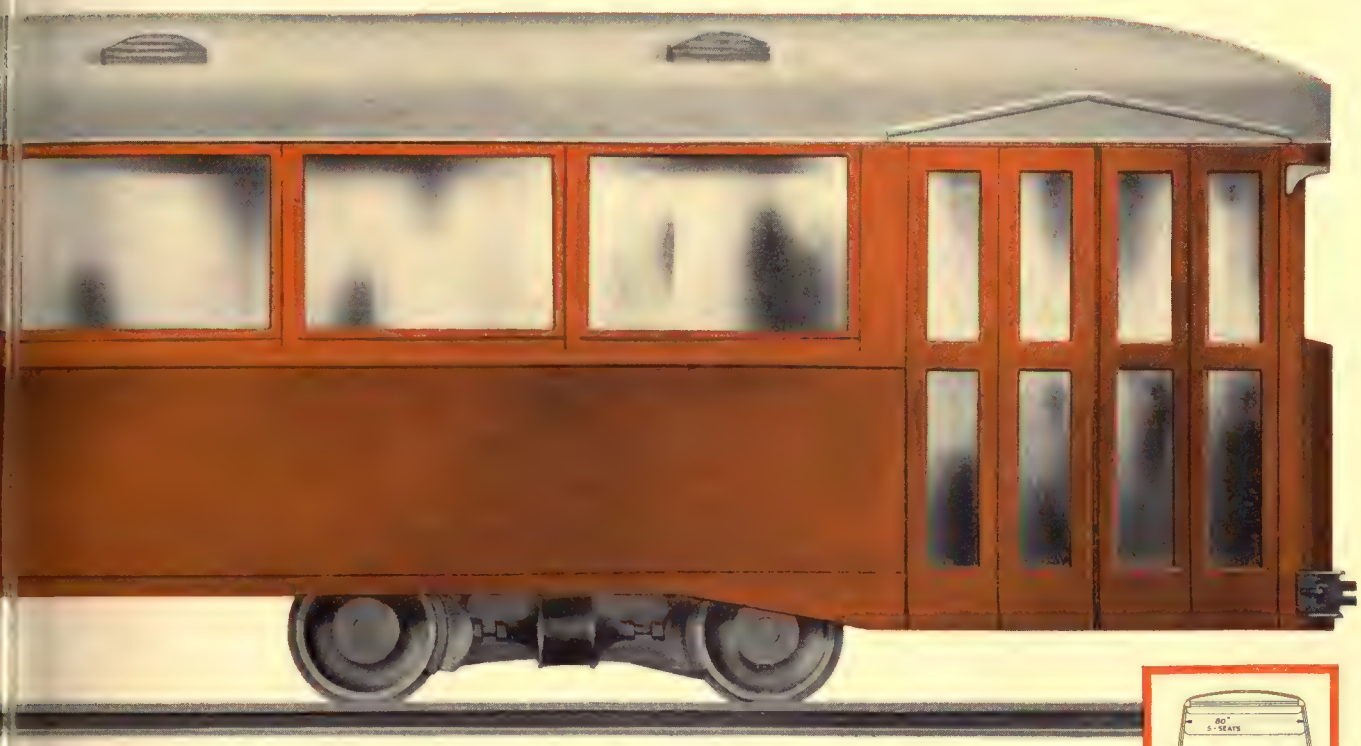




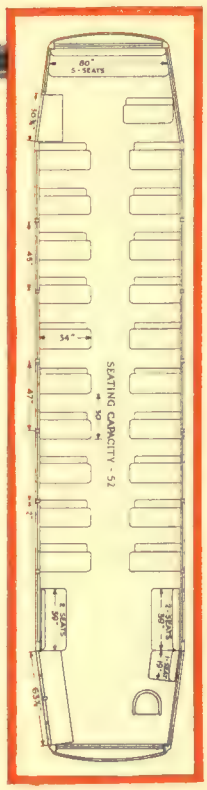
Double End—45 passengers

Standard production model car for single or double end operation

comfortable, swift, quiet, economical transportation



A thoroughly modern light weight car of advanced design, 52-passenger capacity, single end, double truck (4-35 hp. motors) 24,000 lb. *Blueprints and specifications upon request.*



Single End—
52 passengers

Price $12,500.00

F.O.B. ST. LOUIS, MO.

The GENERAL CAR AND COACH CORPORATION *of* ALBANY, N. Y.

MR. O. F. Warhus, President of the General Car and Coach Corporation, after careful consideration has selected the St. Louis Car Co. plant as best adapted for the production of standardized Light Weight Cars and Coaches which his company was preparing to manufacture at Albany, N. Y., thereby saving the industry the expense of additional manufacturing facilities and further reflecting a saving in the price of equipment to Operators. Address all communications to General Car and Coach Corporation, 100 State Street, Albany, N. Y.



MILLER TROLLEY SHOES



Standard . . .

for over 10 years on some of the leading electric railways

Not a new or experimental device, but time-tried established trolley equipment. Miller Trolley Shoes have done away with trolley wheel troubles on scores of properties. The smooth sliding contact has solved the trolley problem on high speed lines where pantagraph equipment would be too expensive. Miller Trolley Shoes cling to the wire . . . around curves . . . across special work. Reduce arcing and jutting. Result in more mileage than wheels . . . and when finally worn out, the little slide is all you have to replace. They cost less than wheels . . . *and the wear on the wires is actually less.* A trial will convince . . . write now for proposition.

MILLER TROLLEY SHOE CO.
Columbia Road, Boston 21, Mass.

FEATURES

Fits standard trolley pole

Requires no lubrication

Reduces dewirements

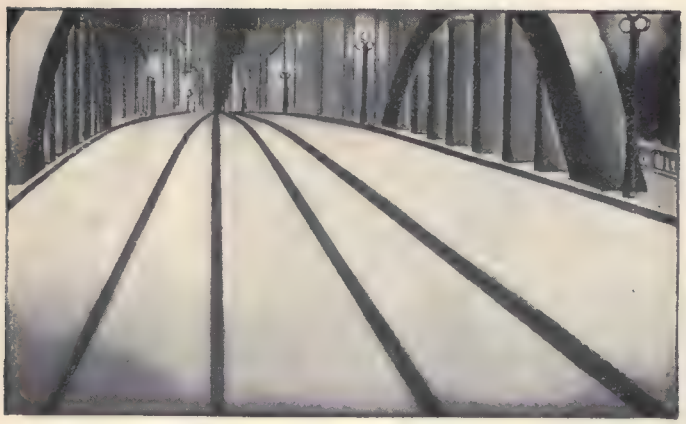
Better collection of current

Less wear on wire

More mileage than wheels

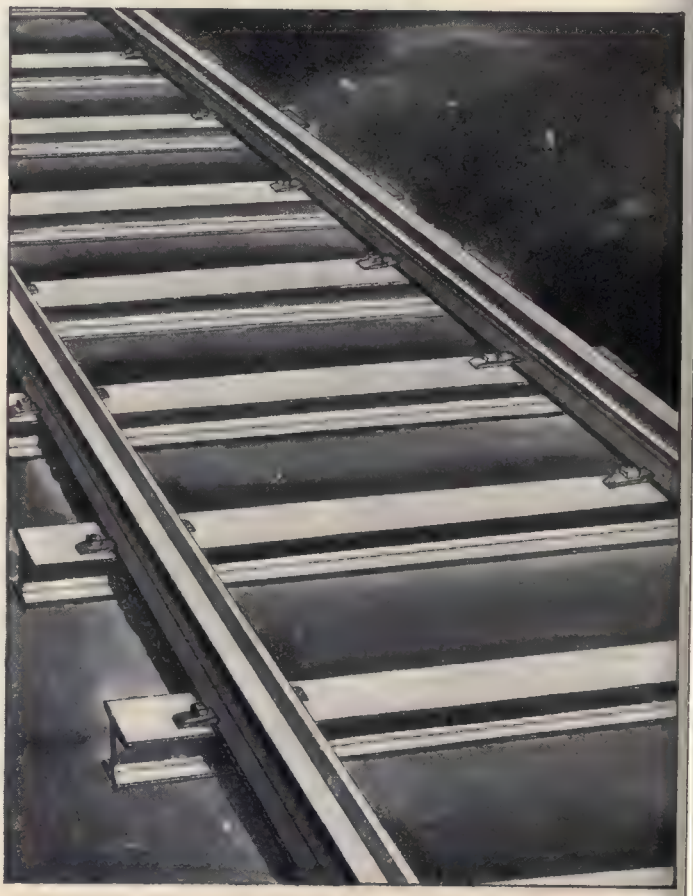
They selected

CARNEGIE STEEL TIES



. . and insured smooth riding for their patrons





THE BEST MEANS a traction company can employ to overcome automobile competition is to provide a comfortable, uninterrupted ride. Attractive car service removes the incentive for the motorist to provide his own transportation—especially in view of the ever-increasing difficulties of parking. Riding comfort begins with the track. Carnegie Steel Cross Ties provide the foundation for a smooth, repair-free track—a track that saves wear and tear on rolling equipment and greatly enhances its comfort—a track providing long, continuous service. Carnegie Steel Cross Ties will prove a profitable investment—particularly from the standpoint of passenger satisfaction. New booklet on request.

CARNEGIE STEEL COMPANY

Subsidiary of United States Steel Corporation

PITTSBURGH, PA.

80

102 YEARS OF MANUFACTURING EXPERIENCE

Rattan car seat webbing may be ordered through any H-W sales office



No. 327-M

FOR INTERURBAN NEEDS

THIS Heywood-Wakefield seat is designed for the modern type of interurban service where comfort is now so important. It has been selected for both new cars and for replacement use.

It has deep, double spring cushions shaped to allow more leg freedom. Mechanism rails are set in. The individual backs are properly pitched for comfort.

Our car seating experts will be glad to help you decide on the best seating equipment for your needs. This service is free through any H-W sales office.



If you have not received a copy of our new Bus Seat Catalogue, write for it.

Heywood-Wakefield
REG. U.S. PAT. OFF.



Heywood-Wakefield Company, Wakefield, Mass.; 516 West 34th St., New York, N. Y.; 439 Railway Exchange Bldg., Chicago, Ill. H. G. Cook, Hobart Bldg., San Francisco, Cal. The G. F. Cotter Supply Company, Houston, Texas. John R. Hayward, Liberty Trust Building, Roanoke, Va. The Railway & Power Engineering Corp., 133 Eastern Ave., Toronto; Montreal; Winnipeg, Canada.



Ex-Divot Diggers *know*

the worth of business papers



"LAST year I got a healthy tan digging divots. This year I've acquired a Pullman pallor digging for business. And let me tell you: this year I realize the dollars-and-cents value of my business papers."

You'll hear the same story from business executives the country over, in every line of industry or trade—yes, and from professional men too. These are the times that try the worth of every business thing. And from the welter of work and worry the business paper emerges with firmer friends and a brighter prestige than ever before.

For the business paper is one institution which, without fuss or feathers, goes quietly about its work of telling how to do a better job. And the business concern of today is up against the problem of doing a better job or going to the wall under pressure of competition.

Hence the greater appreciation of business papers among business men—evidenced by a closer study of their pages and an increased use of the data that business papers bring. Hence the marked confidence in the leadership of business papers—shown by a readiness to follow their lead in the turmoil of changed conditions.

Hence, too, the reliance upon the business paper as a primary advertising medium, indispensable for reaching industry, trade or profession—attested by a notable steadiness of business paper advertising volume.

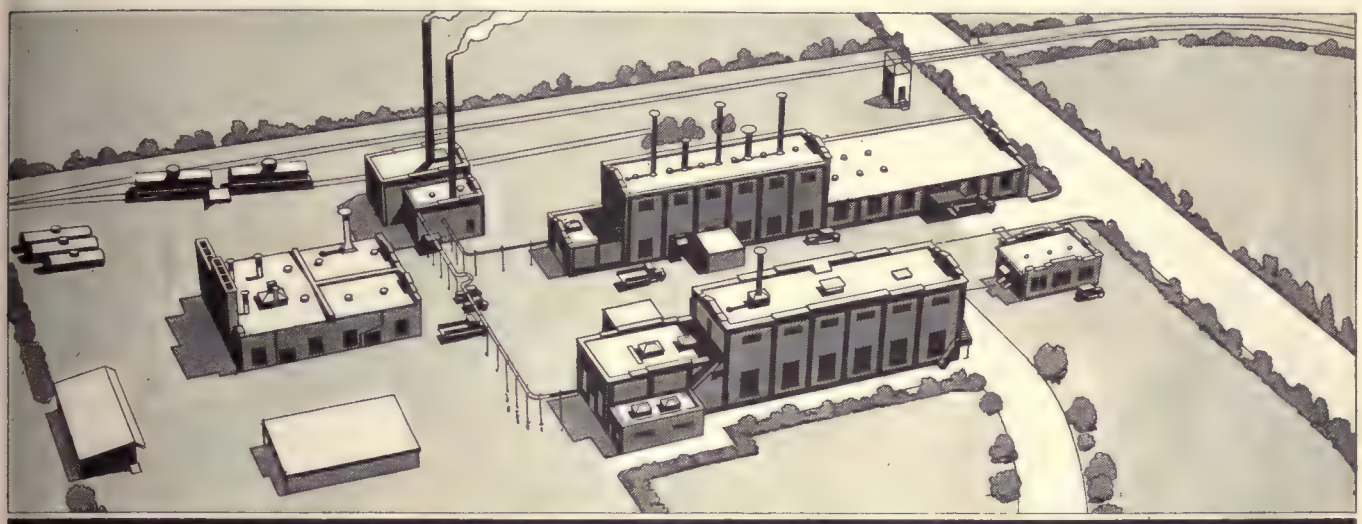
THIS SYMBOL *identifies an ABP paper . . . It stands for honest, known, paid circulation; straightforward business methods, and editorial standards that insure reader interest . . . These are the factors that make a valuable advertising medium.*

This publication is a member of the Associated Business Papers, Inc. . . . a cooperative, non-profit organization of leading publications in the industrial, professional and merchandising fields, mutually pledged to uphold the highest editorial, journalistic and advertising standards.

\+ \+ \+

THE ASSOCIATED BUSINESS PAPERS, INC.
TWO-NINETY-FIVE MADISON AVENUE · NEW YORK CITY

This modern factory makes VARTEX





Vartex Seamless Bias Tapes are free from the extra thickness at the seams which is unavoidable in all sewed seam tapes. Their cost is the same as sewed seam tapes.

VARTEX Varnished Textiles are manufactured by scientific methods in this completely equipped modern factory. Throughout its manufacture the many processes are controlled with exacting care to make a uniform product. The resultant VARTEX has refinements that make it the preferred insulation of the prominent users of varnished textiles.

NEW JERSEY WOOD FINISHING CO., Inc.

FOUNDED 1907

ELECTRICAL INSULATION DEPARTMENT

Woodbridge New Jersey

Are you receiving *The Electric Railway Journal* NEWS?



—the Newspaper of the Electric Railway Field

When *Electric Railway Journal* was changed from a weekly to a monthly magazine, electric railway men everywhere asked us to continue to supply the current news of the field.

For that reason, a supplementary service was started, known as the *Electric Railway Journal* NEWS. It appears as a separate newspaper on thirty-nine Saturdays during the year. On the other thirteen Saturdays, the magazine itself appears with current news.

The *Electric Railway Journal* NEWS keeps its readers posted on court decisions . . recent bus developments . . current legislation enacted concerning electric railways . . changes in fare rates . . news of purchasing activities . . financial and corporate notes . . editorial interpretation of vital news . . personal items on men in the field. This newspaper constitutes the most complete guide to new developments in the field.

Subscription price is low—only $2 for the complete year's service of thirty-nine issues. Foreign rate, $4 annually. Sold in combination with the monthly edition of *Electric Railway Journal* for $5 a year, domestic rate. Send no money now—simply fill in and mail the coupon today!

ELECTRIC RAILWAY JOURNAL
10th Ave. at 36th St., New York

Enter my subscription to *Electric Railway Journal* NEWS. Bill me for $2.

Name .....

Address .....

City ..... State .....

Company .....



OK'd by the Railroads and every industry . . .

Johns-Manville Building Materials protect your property investment

Depreciation and maintenance are minimized wherever Johns-Manville Building Materials are used. Millions of dollars' worth of J-M Building Materials in use by the railroads and every industry, are giving year upon year of free maintenance. Wherever permanence is the first requisite these J-M Materials should be specified.

J-M Built-up Roofs—Buying a J-M Roof is buying exemption from fire, leaks, care and expense. Once your buildings are covered with J-M Built-up Roofs, your roofing problems are ended.

More than twenty distinct types of J-M Roofs are available for your selection. J-M Roofs include not only asbestos roofs—the ultimate in protection—but also asphalt roofs, smooth and gravel topped.

J-M Roofs are applied only by experts known in each community as J-M Approved Roofers. Every J-M Bonded Roof is guaranteed by Johns-Manville and the National Surety Company for an agreed upon term of years.

J-M Transite—For skeleton frame structures, large or small, J-M Transite provides a material which is fireproof, rot-proof, and permanent. It is made of asbestos fibre and Portland Cement, combined under great pressure. It needs no painting, no maintenance whatever. It will actually outlive the steel structure it covers. J-M Transite is by far the most economical material for all but temporary structures. Transite is adaptable to a thousand and one uses—particularly in electrical application.



J-M BUILT-UP ROOFS



J-M TRANSITE



J-M FLOORING

J-M Flooring—Waterproof, crackproof, hard to injure, easy to lay, easy to repair, easy to clean, J-M Industrial Flooring has all these desirable maintenance characteristics. J-M Floors are made in several types to fulfill the requirements of different kinds of service.

On passenger platforms, in machine and car shops and garages, on the car floor itself, a J-M Floor will do a real job for you. And not only is the initial cost low, but records prove that maintenance costs are lower on a J-M Floor.

Other J-M Building Materials

Johns-Manville Asbestos Shingles and Asphalt Shingles find use on the railway property wherever beauty and permanence must be combined. Johns-Manville building material accessories, waterproofings, Celite for Concrete and mortar, J-M Insulating Board, all contribute to low maintenance. J-M Engineers are at all times ready to advise you as to the advantageous use of any of these building materials.

Johns-Manville
SERVICE TO TRANSPORTATION

Tile Flooring, Transite, Packings, Asbestos Shingles, Fibre Conduit. Masticoke & Truss Plate Flooring, Asbestos Exhaust Pipe Covering, Bus & Car Insulation, Brake Blocks and Linings, Built-up and Ready-to-lay Roofing, Electrical Insulating Materials, Refractory & Insulating Cements.

Address JOHNS-MANVILLE
At nearest office listed below
New York Chicago Cleveland San Francisco Montreal
(Offices in all large cities)

Please send me complete information on the following building materials. TS-115-11

.....

.....

.....

Name.....

Address.....

The Fifth Horseman Rides

THE deflationists are in the saddle. The events of the past month have driven home the fact that they have now completely unhorsed not only the New Era enthusiasts of yesteryear, but the majority of the level-headed, intelligent business minds of the country. Though small in number, they have been powerful in influence, and thanks to the disorganization, inertia, lack of leadership, and ignorance of the far-reaching issues involved on the part of the business community, they now dare openly to challenge the forces of progress everywhere.

With the three largest banks lined up on their side—in expressed doctrine, if not in practical action—and with the Federal Reserve authorities standing idly by, it has become clear since the middle of September that what was a comparatively mild business recession during the first half of 1930 has now become a case of world-wide reckless deflation. When a governor of a Federal Reserve bank can stand up before a convention of investment bankers, condemn the American people for using automobiles, electric refrigerators, and radios, and proclaim that he does not agree with those who say that there must be no retrogression from present living standards in this country, we need no further sign of the arrogant self-assurance of the night-riders of defeatism.

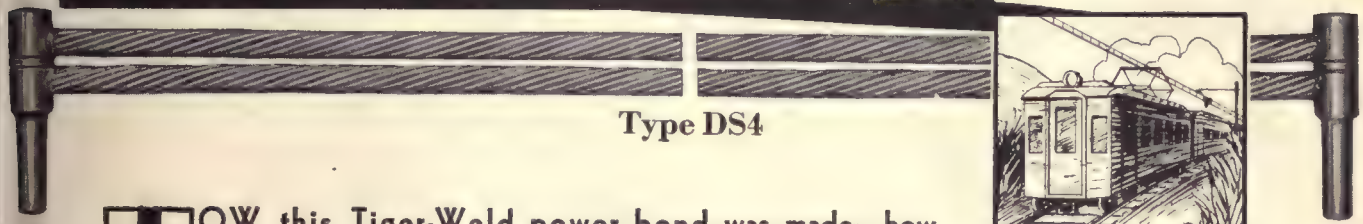
This will be a bitter victory, and we wonder whether those who have led the war-dance of deflation will enjoy the consequences this wintet. Some of them are showing signs of nervousness about the forces that they have let loose upon the world, and are beginning to counsel caution and restraint; but they should have thought about it a little more and a little earlier. For some reason, to this type of mind, inflation enjoys a monopoly of evil and sums up all the economic sins; deflation is altogether a good thing, and there can never be too much of it. It seems to be wholly forgotten that, while a measure of deflation may be necessary after a period of speculative excess, it is a process just as dangerous and calling for as vigilant control as its opposite.

The bitter-enders of deflation who are now in the saddle and are letting the horse run wild are as blind and bigoted as those who were proclaiming an era of permanent and unparalleled prosperity in 1929, and in many cases they are the same people. They forget that this depression takes place in a setting fundamentally different from any in the past. It has behind it the greatest war in world history, with all its consequences in the way of altered social psychology and profound changes in political and economic institutions in every country. They are attempting to cure with their deflation medicine a world not only vastly different from that of fifteen years ago, but one burdened with an unprecedented weight of international and internal debt. They are hoping, secretly or openly, to "liquidate" labor, forgetting that labor is no longer a commodity, but a social consciousness moulded by new standards of living and new aspirations.

They are fighting a losing battle. They may, at the cost of paralyzing investment confidence throughout the world, force it to repudiate its debt to the dead past, but they cannot force it to repudiate its debt to the living present. Though reckless deflation may cause inconceivable chaos and suffering, it will not turn the clock back, it will not make the world of modern science and industry retrace its steps, it will not be able to bury the constructive achievements of the past decade in the grave of "pre-war." The sooner the attempt is renounced the better.

— Editorial from Oct. 22nd
THE BUSINESS WEEK

NOW..a new Power Bond with Strength to Spare ..Yet Capable of Carrying Necessary Current Loads..



Type DS4

Look for the Double Ring Mark in the center of the Terminal Head. It is a sign of Superior Quality and Workmanship.

HOW this Tiger-Weld power bond was made—how American Steel & Wire Company Engineers solved the problem of strength—without sacrificing the ability to carry necessary current—is a story of achievement that you will want to know about in detail. Especially so—since its inception means increased efficiency and lower operating costs. It will pay you to write for interesting literature and detailed information.

Designed for use on multi-tracked A. C. systems. The Pennsylvania Railroad adopted Type DS-4 Bonds for all A. C. Electrified Territory.

TIGER-WELD POWER BONDS

AMERICAN STEEL & WIRE COMPANY

SUBSIDIARY UNITED STATES STEEL CORPORATION

208 S. La Salle Street, Chicago — 30 Church Street, New York

Other Sales Offices: Atlanta Baltimore Birmingham Boston Buffalo Cincinnati Cleveland Dallas Denver Detroit Kansas City Memphis Milwaukee Minneapolis-St. Paul Oklahoma City Philadelphia Pittsburgh Salt Lake City St. Louis Wilkes-Barre Worcester

Pacific Coast Distributors; Columbia Steel Company, San Francisco Los Angeles Portland Seattle Honolulu

Export Distributors: United States Steel Products Co., 30 Church St., New York City



Illustration shows a portion of the engineering department of The DeVilbiss Company

Spray guns of various types and sizes . . . Pressure feed paint tanks and containers . . . Spray booths, exhaust fans and approved lighting fixtures . . . Air compressing equipment . . . Air transformers and accessories . . . Air and fluid hose and connections . . . Complete outfits from the smallest hand-operated units to the largest industrial installations . . .



Among the Winners—

It is not surprising that among the winners of the 1930 Bus Transportation Awards—"Given for the most outstanding examples of progress made in maintenance practices and methods"—are found users of DeVilbiss equipment.

No evidence of DeVilbiss' efficiency could be more convincing. It is doubly impressive because of the far reaching nature of the contest.

All DeVilbiss spray-finishing and spray-painting equipment is designed in our own engineering department. Yet, it is interesting to know that this department does more work for users of DeVilbiss equipment than it does for us.

In the development of spray-finishing equipment and methods—which reduce costs and speed up production—DeVilbiss engineers have saved electric railway and bus operators many thousands of dollars.

Their knowledge and experience is available to you. *Write.*

DeVilbiss
Spray-PAINTING FINISHING System

THE DEVILBISS COMPANY

TOLEDO, OHIO

Sales and Service Branches

NEW YORK PHILADELPHIA CLEVELAND DETROIT INDIANAPOLIS CHICAGO
ST. LOUIS SAN FRANCISCO LOS ANGELES WINDSOR, ONT.

Direct factory representatives in all other territories



"Time to Eat, Joe!"

No need to look at their watches—they know it's 11-30. The electric limited is always on time!

Along thousands of miles of right-of-way modern Timken Bearing Equipped cars daily control the activities of large numbers of farmers and other people who live in close proximity to their routes.

For Timken Bearings have given a new interpretation of punctuality to modern electric car service.

They mean faster running schedules ... schedules freed from hot-box delays and lubrication troubles ... smoother running ... greater riding comfort for passengers ... while car life is lengthened and maintenance costs cut to the bone by the exclusive radial-thrust load ability of Timken tapered construction and Timken-made steel. The Timken Roller Bearing Company, Canton, Ohio.

TIMKEN
Tapered
ROLLER BEARINGS



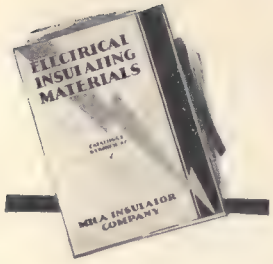
Bent to shape when cold

. . . it's Flexible Super-Micanite

No need to apply heat when forming this built-up mica insulation to fit an armature slot, core, field coil or transformer winding. Flexible Super-Micanite is bonded by a special cement of great adhesivity and flexibility. It is readily bent to small diameters, — cold — without impairing its structure or dielectric strength in the slightest.

In cold oil or when immersed in *oil as hot as 270° F,* its properties as an electric insulator are not impaired nor is the adhesive property of the binder reduced. And because of its high resistivity, Flexible Super-Micanite can be used in thinner sheets.

If you're not acquainted with Flexible Super-Micanite send for test samples.



Complete information is given in Catalog 87. Write for a copy.

MICA INSULATOR COMPANY

New York: 200 Varick St. Chicago: 542 So. Dearborn St.

Works: Schenectady, N. Y. London, England

Cleveland Pittsburgh Cincinnati Birmingham Seattle
San Francisco Los Angeles Toronto Montreal

PERFECT MICANITE INSULATOR REG. U.S. PAT. OFF.

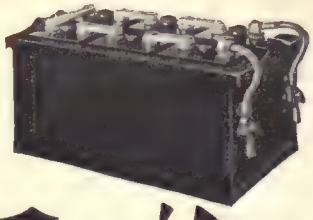
Electrical INSULATION

PERFECT EMPIRE INSULATOR REG. U.S. PAT. OFF

MICA INSULATION OILED CLOTH INSULATION



BUILT FOR HEAVY DUTY



The new Exide Motor Coach Battery is the product of 42 years' experience in building batteries for every purpose. It is constructed to function reliably, steadily and *economically* . . . and the new composition case is built to withstand mud, water, acid, hard knocks. No matter how tough the service, Exides will do their work dependably. That's why so many fleet operators standardize on Exide Motor Coach Batteries.

Exide
MOTOR COACH BATTERIES

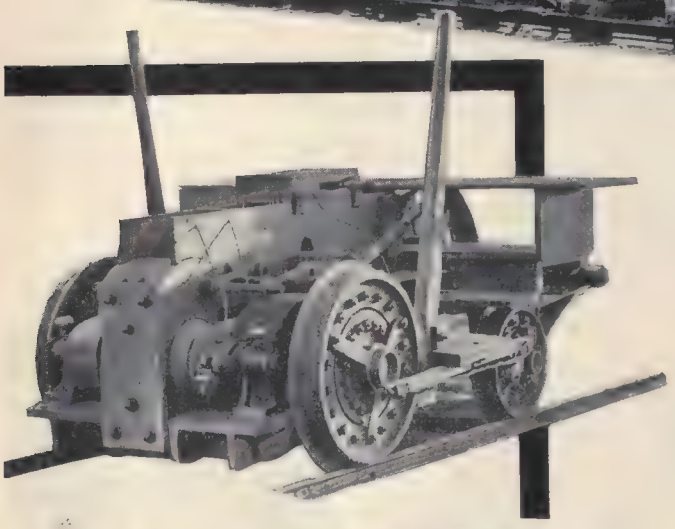
THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia

THE WORLD'S LARGEST MANUFACTURERS OF STORAGE BATTERIES FOR EVERY PURPOSE

Exide Batteries of Canada, Limited, Toronto



Modern, 3000-volt, electric locomotive in use at new Cleveland Union Terminal.



First electric locomotive—built by Thomas Edison in 1880.

another fiftieth anniversary

JUST A YEAR AGO tribute was paid to Thomas Edison on the anniversary of his epoch-making invention—the Incandescent Lamp. This year marks another anniversary which the world may not celebrate, but which people interested in electrical progress will remember—that of Edison's invention of the first electric locomotive.

The little machine pictured at the left was built by Edison in 1880 to prove that the application of electricity to traction was practicable. It was operated with a loose belt and idler control. Hand-levers served as brakes. Current was carried by the rails, through the wheel-rims which were insulated from the axles. The motor was equipped with copper-leaf brushes.

For some years progress was slow. Then came carbon brushes which overcame the greatest difficulty—that of commutator wear. National Carbon Brushes played a vital part in the development which followed. Splendid research facilities, backed by years of experience in carbon manufacture, made possible the constant improvement of brushes.

The march of progress since 1880 is revealed in the illustration at the right, showing one of the huge 3000-volt, electric locomotives recently placed in operation to haul the many trains daily passing through the new Cleveland Union Terminal. In electric traction, as in other applications of power to industry, National Pyramid Brushes occupy an undisputed position of leadership.

NATIONAL CARBON COMPANY, INC.

Unit of Union Carbide and Carbon Corporation

Carbon Sales Division SILVER STRAND CABLE TRADE MARK REGISTERED **Cleveland, Ohio**

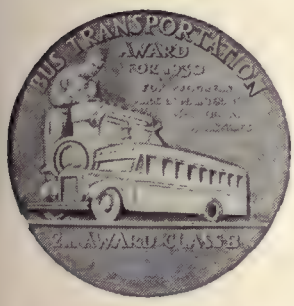
Branch Offices and Factories

New York Pittsburgh Chicago Birmingham San Francisco



. . another prize winner on GOODRICH

WASHINGTON RAPID TRANSIT COMPANY *voted National Award for outstanding progress in* Bus *Maintenance . .*



THE Washington Rapid Transit Company won much public confidence as a result of the great storm of January, 1922.

Twenty-six inches of snow brought the Knickerbocker Theatre tragedy and a complete tie-up of street car lines for two days. But the buses kept running.

Today their 66 buses render the same outstanding service. Continually improved maintenance methods have made that possible. The Washington Rapid Transit Company are to be congratulated for a noteworthy record.

Goodrich Tires are an important factor in keeping up the high efficiency standard of this operation.

The B. F. Goodrich Rubber Company, Established 1870, Akron, Ohio. Pacific Goodrich Rubber Company. Los Angeles, Calif. In Canada: Canadian Goodrich Company, Kitchener, Ont. International B. F. Goodrich Corporation (Export).

Goodrich HEAVY DUTY Silvertowns

SPECIFY GOODRICH ON YOUR NEW BUSES

"... we want service ... advice ... and rush delivery"



This property is representative of the "Globe" answer to such demands. Within a month of receipt of their inquiry we were working on their order for 3,000,000 tear-off transfers of a new type. A week later the first shipment was forwarded by express.

Globe facilities can be expanded for *any* transfer-ticket service.

Globe

TICKET COMPANY

Philadelphia

Factories:
Philadelphia
Boston
New York
Los Angeles
Atlanta

Sales Offices:
Baltimore
Cincinnati
Cleveland
Pittsburgh
Albany





Madison, business section



Residential section



What happened to the old eet cars—a tourist camp.



Typical—

of over 200 other all—Bus Cities—

Fort Madison, Iowa

There are 1032 cities in America with a population of over 10,000 . . . Well over 200 of these cities, or more than 20 per cent, are now being served *exclusively* by bus . . . Here is a recent example of how a small city *of only 13,000 population* has gone "all bus"—with surprising results.



IN 1884, about the time that Thomas A. Edison was preparing to astonish civilization with the first incandescent lamp  a progressive little community at Fort Madison, Iowa  was busily engaged in organizing its first street railway system.

The minutes of that early meeting contain the following appropriations—

6 cars	$3,500.00
Mules	2,000.00
Harness	100.00
Hay and Oats	72.00
Construction of lines	11,109.00
Length of routes	6 miles
Wages per man per 12 hour day	1.50
Revenue per day per mule car	7.00
Expense per day per mule car	5.24

Eleven years later (in 1895) it was recognized that mule drawn cars  were no longer "modern." Times had changed. Other cities were taking advantage of an amazing new development—the electric street car  —and Fort Madison swung in line. An alert management decreed that the mules must go—and history records that the company salvaged $387.17 on their sale. 

The property was electrified at a cost of $27,750—but again times changed. The automobile arrived  and multiplied.  People changed their riding habits—not only in Fort Madison, but everywhere. And again revenue dropped. The transportation system then in force could not compete with the new, fast and comfortable mode of travel.

Hundreds of other cities were facing the same problem of turning red figures into black—and Fort Madison set itself to the task. In April, 1930, the management again made a change and took the same step that over 200 other small American cities had taken. The unprofitable rail lines were abandoned, five 21-passenger Yellow Type U Coaches



were purchased and Fort Madison became another all-coach city.

Now Fort Madison has a total population of only 13,000. Transportation men everywhere recognize how difficult it is to render a local transportation service in cities of such small size—yet today Fort Madison sees daylight ahead.

Already income equals expense. Riding is rapidly increasing and thanks to a satisfied public, revenue is steadily growing.

Almost 50,000 people ride Yellow Coaches in Fort Madison each month at a 10 cent rate of fare—3 tokens for 25 cents—7 for 50 cents.

What Fort Madison—a city of only 13,000 population is accomplishing through the proper selection of equipment and careful management—is being duplicated in over 200 other small American cities.

Experience proves the economic value of such a program. Performance proves the value of standardizing on Yellow Coaches.

Yellow Coaches

FORT MADISON STREET RAILWAY CO.

FORT MADISON, IOWA

BUS OPERATING EXPENSE

JULY AND AUGUST, 1930

MAINTENANCE OF EQUIPMENT	July	Per Bus Mile	August	Per Bus Mile
Supt. of Equip.	$175.00	.0062	$175.00	.0061
Bldgs. & Shop.	19.83	.0007	17.70	.0006
Garage Rent	70.00	.0025	70.00	.0024
Repairs to Bodies			11.07	.0004
Repairs to Chassis	20.47	.0007	64.97	.0022
Repairs to Engines	118.33	.0042	30.32	.0011
Repairs to Ig. & Lt. Cts.	36.75	.0013	47.55	.0017
Tire & Tube Repairs & Main.	423.24	.0150	429.51	.0150
Depreciation	864.48	.0300	859.02	.0300
Inspection & Oiling	81.00	.0029	105.98	.0037
		.0635		.0632
POWER				
Gasoline	371.18	.0132	368.49	.0128
Lubrication	30.18	.0010	31.69	.0011
		.0142		.0139
TRANSPORTATION				
Supt. of Trans.	135.00	.0048	135.00	.0047
Operators Wages	1210.27	.0432	1209.53	.0421
Washing & Cleaning	102.13	.0036	98.00	.0034
Miscellaneous	1.64	.0001	6.00	.0002
		.0517		.0504
GENERAL EXPENSE				
Insurance P. L. & P. D.	350.00	.0124	350.00	.0122
Insurance Fire, Etc.	100.00	.0035	100.00	.0035
Office	166.00	.0059	167.00	.0058
Taxes General	50.00	.0018	50.00	.0017
Taxes Gasoline	99.60	.0035	98.88	.0034
Licenses	53.50	.0019	53.50	.0019
Misc. General Expense	131.19	.0047	102.44	.0036
		.0337		.0321
Total operating expense		.1631		.1596
Total bus miles operated	28216		28634	

it can be done . . . with

YELLOW COACHES

GENERAL MOTORS TRUCK CO.

Subsidiary of Yellow Truck & Coach Mfg. Co.

PONTIAC, MICH.



70

ELECTRIC RAILWAYS
are building track with Differential Cars.

Whether large track reconstruction programs are contemplated or small maintenance jobs, Differential cars will do the work with less cost than other methods. Differential cars save time and labor. Do not interfere with other traffic. Strengthen public relations. Require little maintenance. Are absolutely safe and have an unusually long life.

Other Differential equipment for track maintenance and construction include the Differential Electric Locomotive Crane Car, the Clark Concrete Breaker, the Differential Bottom Dump Ballast Car, the Differential 3-way Dump Body for auto trucks and the Differential Car Wheel Truck and Tractor for power shovels.



THE DIFFERENTIAL STEEL CAR CO.

FINDLAY, OHIO

Is this Coincidence?

All three winners in a national speed contest for rapid transit lines use car oils made by Standard Oil Company (Indiana)

We are not trying to convince you that Standard Oil Company (Indiana) car oils were the chief factors in winning this contest. But we do want to register strongly the fact that all three winners, noted for the high speed maintained on scheduled runs day after day, are constant users of Standard Oil Company (Indiana) car oils.

Only with correct lubrication could these rapid transit lines maintain continuous high speed service. It is not only the ability of Standard Oil Company (Indiana) car journal oils to lubricate effectively at all speeds but likewise the savings they make possible by reducing bearing troubles, power costs, waste and babbitt metal that make them popular with electric railway officials . . . and worthy of your consideration.

These journal oils are made of especially selected lubricating stocks and are refined for this one purpose. They do not glaze or harden on the waste. This reduces oiling periods, saving labor and waste costs. They have proven to be very successful in both high speed interurban and ordinary street car service.

One of our men will be glad to discuss these oils with you . . . at your convenience.

STANDARD OIL COMPANY *(Indiana)*
General Offices: 910 S. Michigan Avenue, Chicago, Ill.

LUBRICANTS *for* ELECTRIC RAILWAYS

210-1



LORAIN

TRACK EQUIPMENT

Lorain
Manufactures
GIRDER RAILS
GIRDER GUARD RAILS
PLAIN GIRDER RAILS
RAIL JOINTS AND TRACK ACCESSORIES
EXPANSION JOINTS FOR ELECTRICALLY WELDED TRACK
SPECIAL TRACKWORK
SWITCHES, FROGS AND CROSSINGS
in
Solid Manganese Steel, Manganese Insert Construction, Chrome Nickel Steel Insert Construction and Built-up Construction of all heights and weights of rail.

As their requirements for track equipment become more diverse, street railway companies place greater and greater dependence on LORAIN. For LORAIN'S ability to serve is not confined to any one type of trackwork, nor to the conditions in any one community, city or county.

New installations, extensions, replacements—these activities are reasons for you to avail yourself of manufacturing facilities, of a complete line, and of knowledge and experience that have been building up ever since horse-car days.

Whatever you need in track equipment, LORAIN leads in designing and making. Are you testing our ability to serve you?

THE LORAIN STEEL COMPANY

JOHNSTOWN, PA.

SUBSIDIARY OF UNITED STATES STEEL CORPORATION

PRINCIPAL SUBSIDIARY MANUFACTURING COMPANIES

AMERICAN BRIDGE COMPANY
AMERICAN SHEET AND TIN PLATE COMPANY
AMERICAN STEEL AND WIRE COMPANY
CARNEGIE STEEL COMPANY
COLUMBIA STEEL COMPANY
CYCLONE FENCE COMPANY
FEDERAL SHIPB'LDG. & DRY DOCK CO.
ILLINOIS STEEL COMPANY
NATIONAL TUBE COMPANY
THE LORAIN STEEL COMPANY
TENNESSEE COAL, IRON & RAILROAD CO.
UNIVERSAL ATLAS CEMENT COMPANY

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LORAIN SALES OFFICES—*Atlanta Chicago Cleveland Dallas New York Philadelphia Pittsburgh*

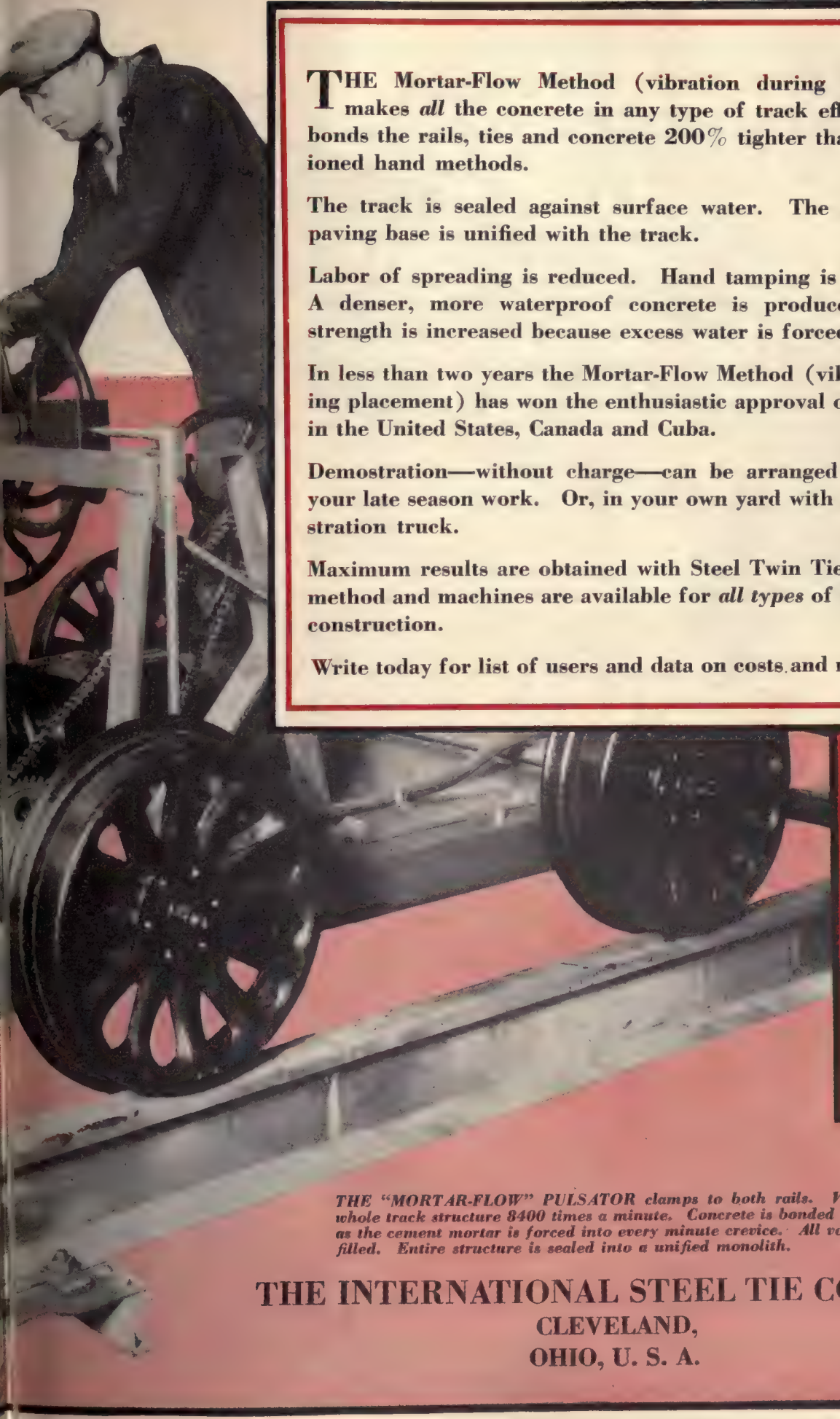
Investigate the

MORTAR FLOW METHOD

VIBRATION DURING PLACEMENT

The Most Revolutionary Improvement in Paved Track Since Welded Rail Joints





THE Mortar-Flow Method (vibration during placement) makes *all* the concrete in any type of track effective. It bonds the rails, ties and concrete 200% tighter than old fashioned hand methods.

The track is sealed against surface water. The paving and paving base is unified with the track.

Labor of spreading is reduced. Hand tamping is eliminated. A denser, more waterproof concrete is produced, and its strength is increased because excess water is forced out.

In less than two years the Mortar-Flow Method (vibration during placement) has won the enthusiastic approval of engineers in the United States, Canada and Cuba.

Demostration—without charge—can be arranged on any of your late season work. Or, in your own yard with our demonstration truck.

Maximum results are obtained with Steel Twin Ties. But the method and machines are available for *all types* of paved track construction.

Write today for list of users and data on costs and results.

THE "MORTAR-FLOW" PULSATOR clamps to both rails. Vibrates whole track structure 8400 times a minute. Concrete is bonded to steel as the cement mortar is forced into every minute crevice. All voids are filled. Entire structure is sealed into a unified monolith.

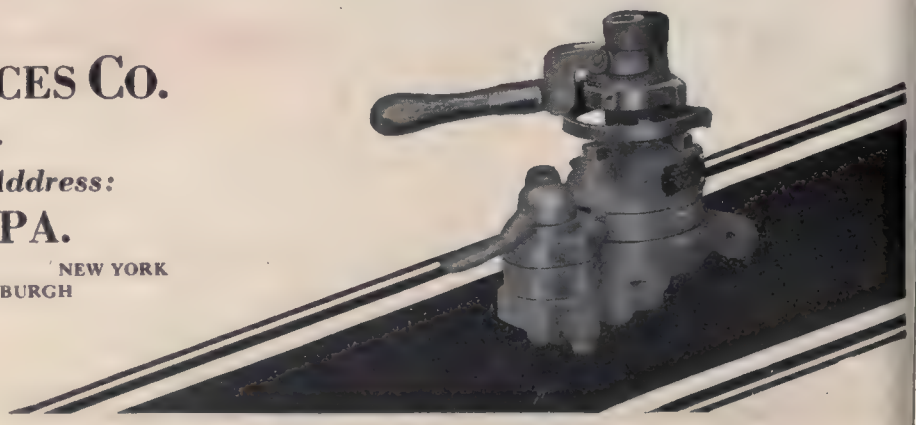
THE INTERNATIONAL STEEL TIE COMPANY

CLEVELAND,
OHIO, U. S. A.

The SAFETY CAR CONTROL EQUIPMENT

Speeds Transportation SAFELY

When conditions impel shorter headway to reduce waiting time of patrons . . . quicker brake applications to reduce stopping time . . . rapid interchange of passengers to cut down standing time . . . prompt release of brakes to permit quick get-away . . . THEN the Safety Car Control Equipment will speed up service while maintaining the basic element of safety.



SAFETY CAR DEVICES CO.

OF ST. LOUIS, MO.

Postal and Telegraphic Address:

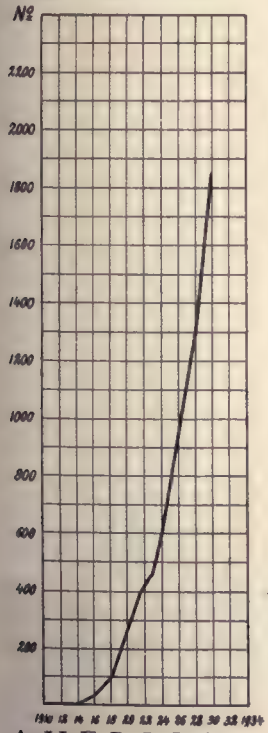
WILMERDING, PA.

CHICAGO SAN FRANCISCO NEW YORK
WASHINGTON PITTSBURGH

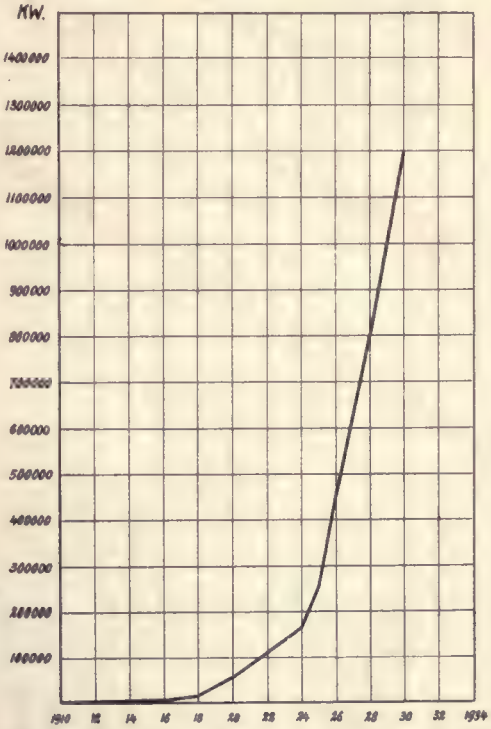


Some figures that substantiate the predicted eclipse

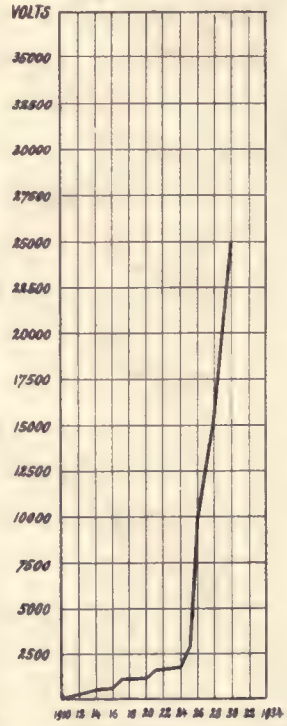
Total number of Brown Boveri power rectifiers delivered from 1910 to 1930.



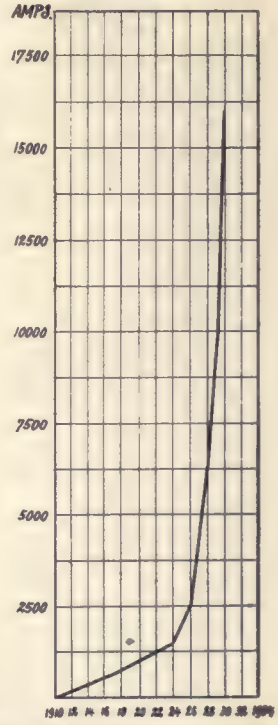
Total output of all the Brown Boveri power rectifiers delivered from 1910 to 1930.



Increase in rated voltage of Brown Boveri power rectifiers between 1910 and 1930.



Increase in rated current of Brown Boveri power rectifiers from 1910 to 1930.



AMERICAN BROWN BOVERI CO., INC., CAMDEN, N. J.

AMERICAN BROWN BOVERI

COMING — *in January*

Statistics of City and Interurban Electric Railways and Electrified Steam Lines

(As of January 1, 1931)

	Number of Operating Companies	Miles of Track	Passenger Cars		Electric Locomotives	Freight Cars		Service Cars	Buses Operated	Miles of Bus Route
			Motor	Trailer		Motor	Trailer			
New England States										
Connecticut										
Maine										
Massachusetts										
New Hampshire										
Rhode Island										
Vermont										
Eastern States										
Delaware										
District of Columbia										
Maryland										
New Jersey										
New York										
Pennsylvania										
Virginia										
West Virginia										
Central States										
Illinois										
Indiana										
Iowa										
Kentucky										
Michigan										
Minnesota										
Missouri										
Ohio										
Wisconsin										
Southern States										
Alabama										
Arkansas										
Florida										
Georgia										
Louisiana										
Mississippi										
North Carolina										
South Carolina										
Tennessee										
Western States										
Arizona										
California										
Colorado										
Idaho										
Kansas										
Montana										
Nebraska										
North Dakota										
Oklahoma										
Oregon										
South Dakota										
Texas										
Utah										
Washington										
Wyoming										
U. S. Total										
U. S. Possessions										
Canada										
Grand Total										

Annual Statistical and Progress Number

up-to-date figures on every important phase of the industry—with interpretations and forecasts of 1931 trends

An issue you'll want to study!

ELECTRIC RAILWAY JOURNAL

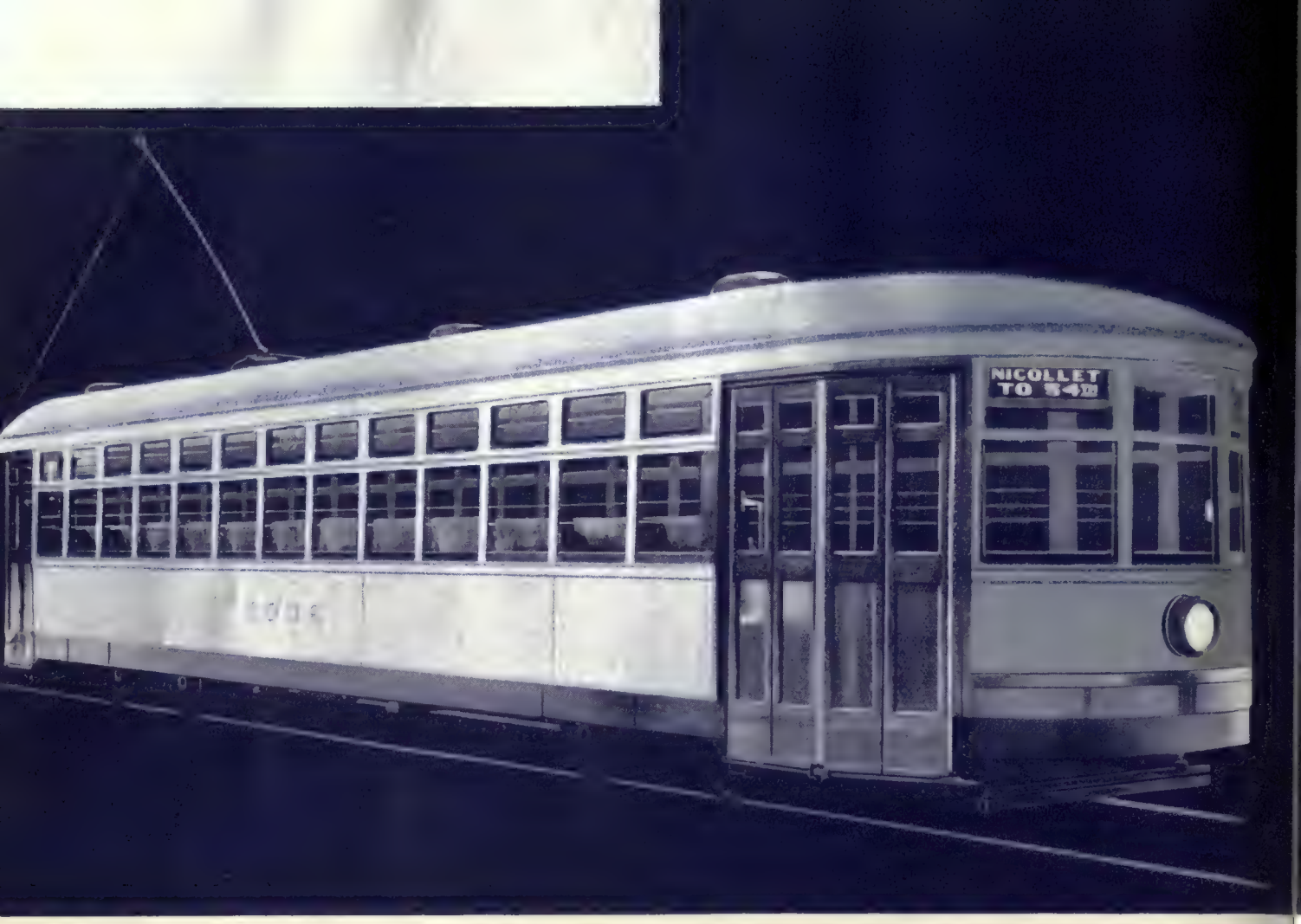


ALCOA
ALUMINUM

Thousands of pounds lighter—Aluminum Street Cars move more passengers with smaller motors



ALCOA ALUMINUM



1372 pounds of Alcoa Aluminum used 2618 pounds of dead-weight saved

Is a 2,600 pound passenger riding around on each of your cars, paying no fare but costing you dollars a year in power, in track and road bed wear, in brake wear and in decreased speed and sluggish acceleration?

This car, built and operated by the Twin City Rapid Transit Company, is 2,618 pounds lighter because the light, strong Alloys of Alcoa Aluminum were used for sheets, posts and carlins.

Cars built of the light, strong Alloys of Alcoa Aluminum have many advantages. They are speedy on the get away—they make swifter schedules—they almost stop on a dime. Such a car will attract more passengers than th old-fashioned heavy, slow car.

The light, strong Alloys of Alcoa Aluminu have all the needed strength. They have gre resistance to corrosion. They help to kee cars out of the shop. They are as easy t work as other structural metals. And the weigh only ⅓ as much as iron or steel.

Our nearest office will gladly send a repr sentative who can give you full informatio on the use of Alcoa Aluminum and its Alloys for car construction. Address ALUMINUM COMPANY *of* AMERICA; 2463 Oliver Bldg., PITTSBURGH, PA.

ALCO
ALUMINUM
TRADE MA



ALCOA ALUMINUM



The rolling process in the manufacture of Wrought Steel Wheels further refines and toughens the metal.

"Standard" wheels will give increased mileage and freedom from trouble.

Axles
Armature Shafts
Wrought Steel Wheels
Springs

STANDARD STEEL WORKS COMPANY

General Offices and Works: Burnham, Penna.

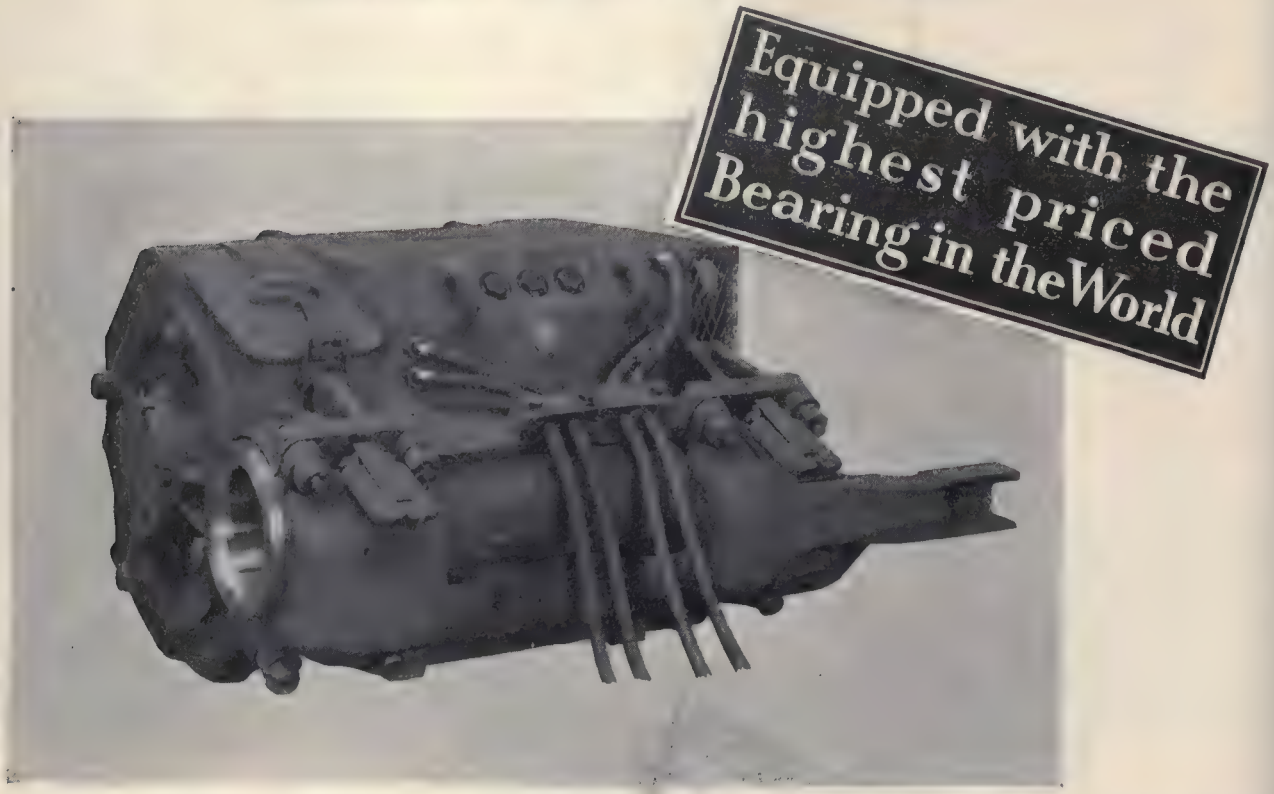
Sales Offices:
NEW YORK RICHMOND PHILADELPHIA

PORTLAND

Sales Offices:
CHICAGO ST. LOUIS SAN FRANCISCO

ANOTHER MANUFACTURER IN THE ELECTRICAL INDUSTRY THAT USES SKF BEARINGS

GENERAL ELECTRIC COMPANY



SKF PERFORMANCE KEEPS G. E. MOTORS ON LOW COST BASIS FOR RAILWAYS

AT first glance unseen yet, electric motors play an important part in the the efficient operation of street railway systems. Speed of service, performance and low maintenance costs hinge largely on the type of motors used and their component parts. Outstanding in this field, where performance takes preference over price, you will find SKF Bearings first choice for motors.

On the G. E. 710-A Railway Motor, as well as on many other types built by General Electric for similar service, you will find SKF Bearings meeting the most exacting demands of every day performance. Rugged, long-life SKF Bearings are a definite factor in maintaining the high efficiency of motors. They require no adjustments and show so little wear that electrical troubles usually traceable to this cause are eliminated. Servicing, too, is materially reduced for sealed housings exclude dirt and moisture and retain lubricant for long periods.

SKF INDUSTRIES, INC., 40 East 34th Street, New York, N. Y.

2610

EQUIPPED WITH THE HIGHEST PRICED BEARING IN THE WORLD

Means just this

SKF

Ball and Roller Bearings

That the manufacturers whose product is illustrated above preferred to pay more for their bearings and less for servicing or replacing them. They preferred to pay a higher price in the beginning than many times this higher price in the end. And, finally, they preferred to economize by using SKF bearings because they are made to do their job, not to fit a price list.

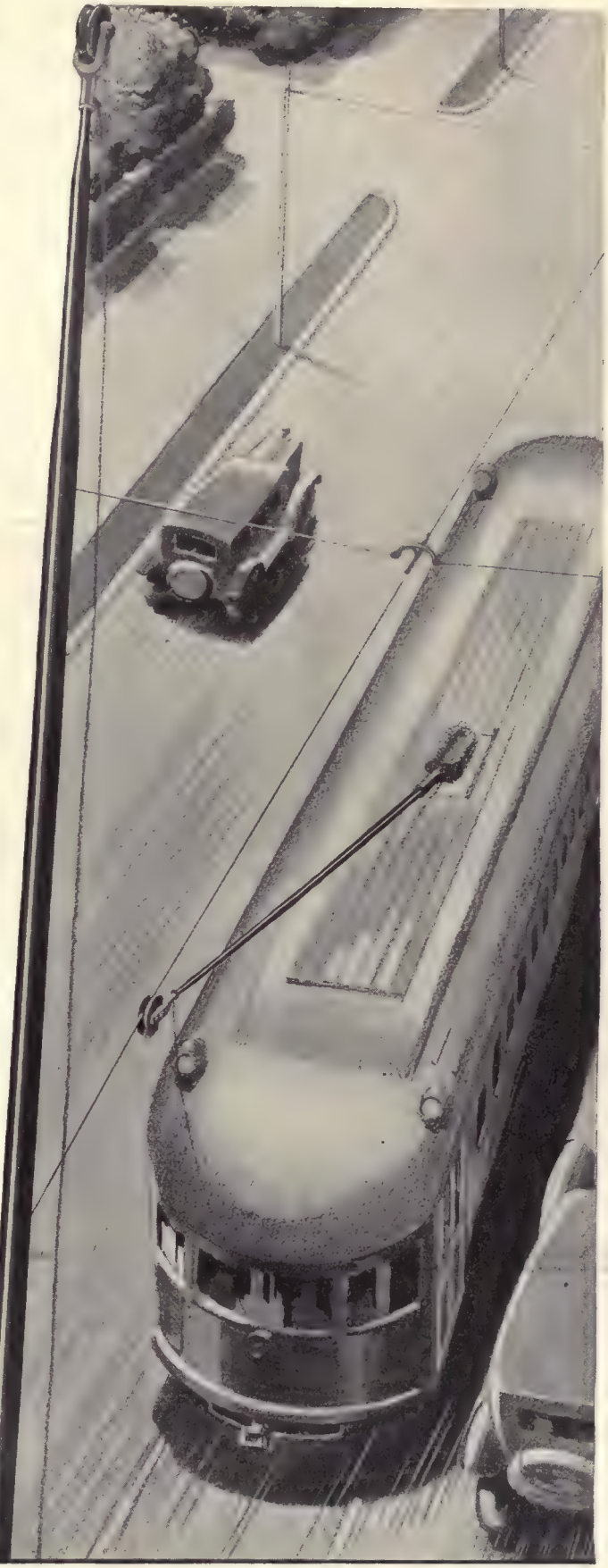
There are also fewer delays with Trolley Poles that are Built to Live Long and Travel Far

REGULARITY and efficiency in electric railway service are measured increasingly, today, by the ability of trolley poles to "stay put"—with few repairs or replacements.

To minimize the possibility of any defective pole being installed, every NATIONAL-SHELBY Trolley Pole is individually tested before it leaves the mill—a form of test that approximates actual service conditions. Long life and satisfactory service are assured by the use of a selected grade of steel, which is given special heat treatment prior to the last drawing operation.

NATIONAL-SHELBY Poles have a special reinforcement integral with the body of the pole and so placed as to add great strength without excess weight. Write for complete information.

NATIONAL TUBE COMPANY
Subsidiary of United States Steel Corporation
PITTSBURGH, PA.



NATIONAL *SHELBY SEAMLESS* **POLES**



THE LONGEST FORWARD STEP IN MOTOR OIL

the new

SOCONY MOTOR OIL

Perfected...proved... in every way

THIS is an announcement so important to every bus owner that we put aside all technical language and tell it to you in the simplest words.

We have produced the New Socony Motor Oil which gives you—to a greater degree than any other—what you want and should have in a motor oil . . . *full lubricating value.*

In the new Socony Motor Oil "full lubricating value" means something more than it ever has meant before. For we have perfected and proved for you not just one or two but *every* characteristic a motor oil should have.

Here are five reasons for changing today to the New Socony Motor Oil:

1. ***Perfected Lubrication. Less wear on your motor.*** The new Socony Motor Oil is made from a Paraffin Base crude, selected because of its greater inherent oiliness (adsorption). Exclusive New Socony Process gives additional lubricating value.

2. ***Minimum Oil Consumption. Will not break down.*** No engine heat or pressure severe enough to decompose this oil or destroy its lubricating value. Only through contamination by foreign matter which finds its way into the crankcase can the life of this oil be limited.

3. ***Easy Starting in Coldest Weather.*** Selected Paraffin Base oil . . . completely de-waxed. More fluid at low temperatures than any other oil. Instant lubrication. Less drain on your battery.

4. ***Fuel Economy and Increased Power.*** Maintains proper "body" at all engine temperatures. Result: perfect piston seal, maximum power, and minimum fuel consumption.

5. ***A Clean Motor.*** New refining process reduces to a minimum all harmful elements which cause carbon, gum and sludge. The new Socony Motor Oil insures a clean motor.

STANDARD OIL COMPANY OF NEW YORK

GARY

WROUGHT STEEL WHEELS



As the word "Sterling" indicates high quality so does the name "ILLINOIS" on a wrought steel car wheel indicate a SAFE product manufactured in a modern mill, rigidly inspected, and produced according to A.R.A. and A.E.R.A. Specifications.

Our wheel engineers are at your service.

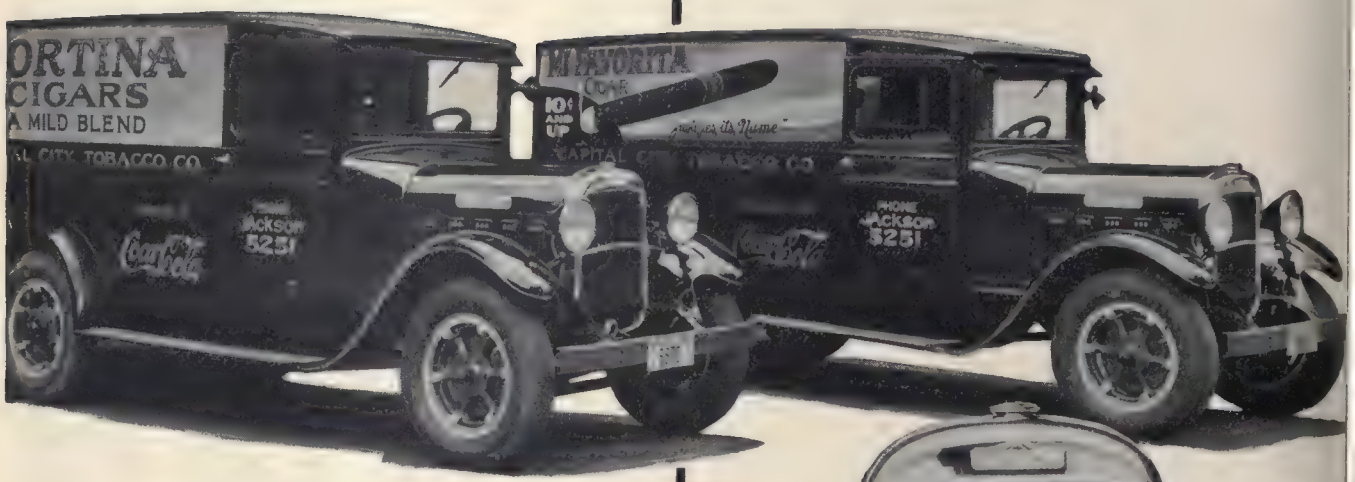
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FEDERAL TRUCKS ARE EQUIPPED WITH LONG RADIATORS





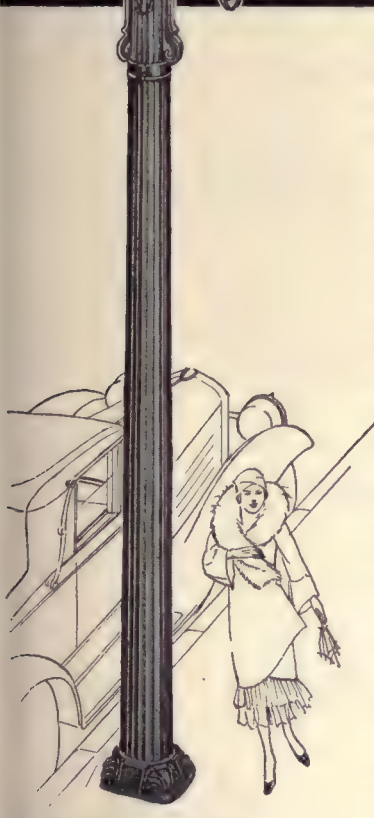
LONG PRODUCTS
AUTOMOTIVE
CLUTCHES AND
RADIATORS

LONG

LONG MANUFACTURING CO., DETROIT, MICHIGAN

Just Wires - but they mark a CENTURY OF PROGRESS





SUPPOSE every wire in the country were to be swept away this moment. In one stroke, we would all be plunged back nearly a century to the era of smoky kerosene or gas lamps, our factories silent, our skyscrapers almost worthless, our electric railway transportation stopped, our radio, electric refrigerator, washing machine and other appliances useless. No telephone or telegraphic services available. Business at a standstill.

Only a catastrophe such as this could bring home how much we rely on those small wires which are so common as to pass unnoticed. Through them flows the substance which turns the wheels of industry, lightens home labors, creates our means of communication, transports us and makes our streets and homes safe and beautiful with light.

Economy and efficiency require the use of pole supports for the wires. It is to these poles that Union Metal has, for years, turned its attention in an effort to develop a support so strong that street lighting equipment, trolly span wires, distribution lines and other services might be combined on one pole and yet so harmonious in design as to lend beauty and dignity to the finest avenues.

How well this result has been achieved can be judged from this fact. Utilities throughout the country — always on the alert for equipment correct in engineering principle and which meets with public approval — are keeping Union Metal plants operating twenty-four hours a day to take care of the demand.

We shall be glad to supply full information on Union Metal Fluted Steel Distribution Poles to anyone interested in improved street appearance.

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GENERAL OFFICES AND FACTORY • CANTON, OHIO
SALES OFFICES: New York, Chicago, Cleveland, Boston, Los Angeles, San Francisco, Seattle, Dallas, Atlanta
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Designed by Otis Peter

UNION METAL DISTRIBUTION POLES





They Jes' Keep Rollin'—

DAY in and day out, in rain, sleet, snow, ice, Kalamazoo Trolley Wheels keep rolling along. Durable, efficient they seldom need attention.

That is why leading Electric Railways use them and why we have supplied many of our customers for more than twenty-five years.

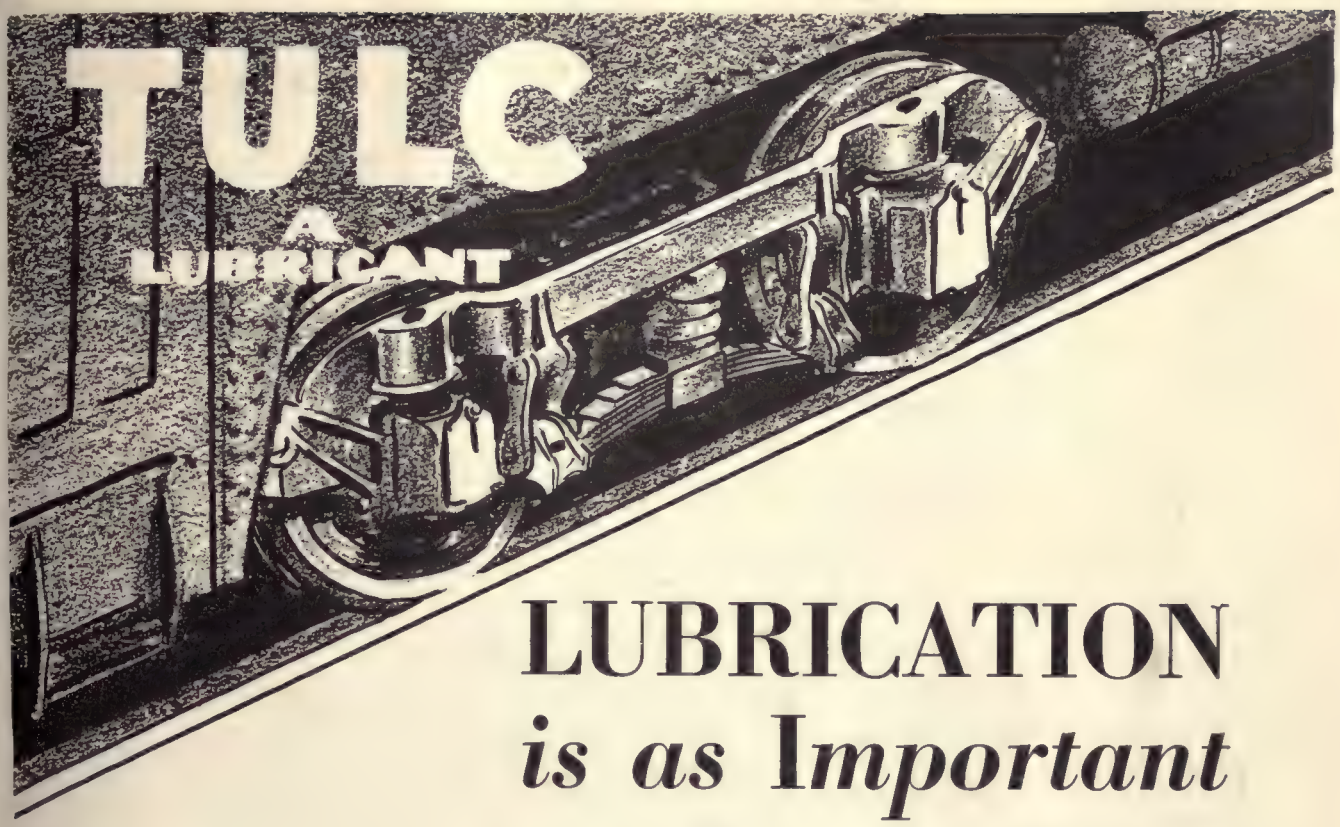
We will be glad to mail you our illustrated catalog upon request. *Write for it.*

THE STAR BRASS WORKS

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KALAMAZOO



LUBRICATION *is as Important as Equipment*

***Make a Test of* TULC**

The first cost is not actual cost in lubrication.

One user of Tulc writes: *"We have been using Tulc since July 28, 1926 and have had no failures due to hot bearings."*

Good lubrication is more economical than new bearings.

The* UNIVERSAL LUBRICATING CO.,** ***Cleveland, Ohio

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"SWING MOTION"

TRUCKS

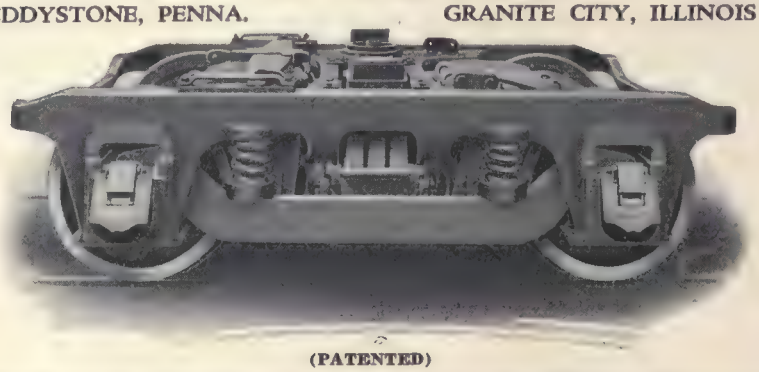
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They specify Commonwealth Trucks because of simplicity and strength of construction, excellence of design, material, and workmanship, elimination of repairs, and costly maintenance. Write for full information and make your own comparisons.

General Steel Castings Corporation

EDDYSTONE, PENNA. GRANITE CITY, ILLINOIS



(PATENTED)

A Great Advancement in BUS REGISTER Design

The New INTERNATIONAL R-13

Investigate the R-13 at once. Note its many advantages. To standardize on R-13 is to make sure of satisfactory fare registration. There are many new features you will appreciate.



LOW COST LONG LIFE LIGHT WEIGHT

Handsome, Compact, Easily Operated

WRITE FOR FREE TRIAL OFFER

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You can tell at a glance whether a glass insulator is free from defects and flaws. That's another one of the five reasons glass

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Do you know the other four? Our catalog tells you why—Write for a copy.

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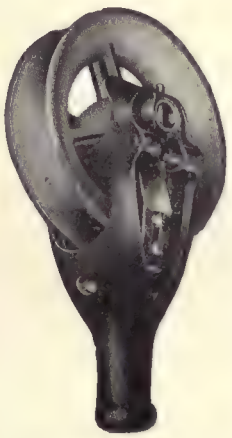
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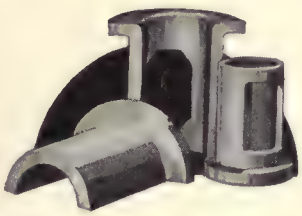
They are of proper quality and design....economically meeting the most severe needs of modern Street Car operation . . . . . .



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Trolley Wheels and Harps



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M-J Armature Babbitt

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FACE THE FUTURE — PAVE WITH BRICK

This MANGANESE Weld



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has practically the same

—Manganese Content
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as the parent metal.

MANGANESE track welds made with TIMANG Manganese Welding Rod have practically the same characteristics as the original metal.

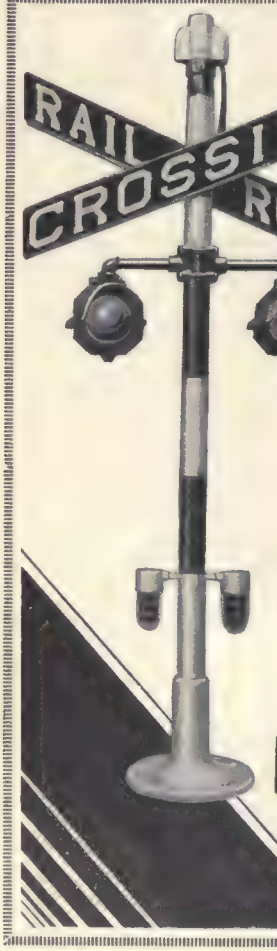
The illustration shows a crossing on a main line which failed and was then quickly welded with TIMANG. It was kept in service on this line for four months and then removed to another piece of track. It is still in service, in excellent condition.

No longer are maintenance of way engineers forced to discard thousands of manganese castings yearly. They can now weld with TIMANG—with full assurance of a perfect bond and long, satisfactory service.

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ACCIDENTS won't happen at railway crossings guarded by Nachod Signals. Two commanding red lights, flashing on and off, and an insistent bell automatically warn of every car's approach. Full 24-hour safety, made doubly sure by a motorman's indicator. No property loss. No damage suits. Passenger good-will maintained. Let us quote you the cost of safe-guarding crossings on your lines.

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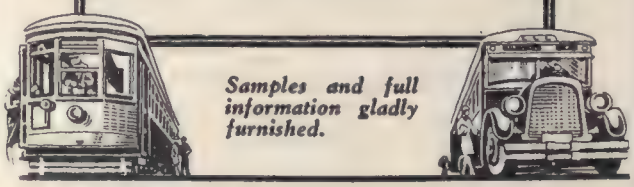
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Tucolith is the popular flooring material for cars and busses.

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"Diamond-S" brake shoes, because of their special features which are patented, stand up in this hard service longer than ordinary brake shoes. It is economy to use them.

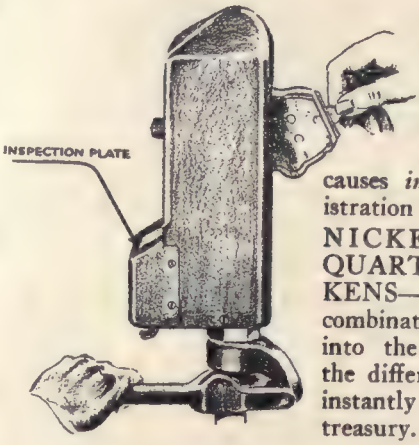
"DIAMOND-S" BRAKE SHOES

The American Brake Shoe and Foundry Company

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Fare Collection,

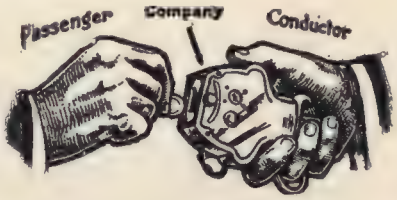


to avoid the old temptations and leaks, *necessitates the coin-slot mechanism.*

Coin - insertion causes *instantaneous* registration *by the patrons.* NICKELS, DIMES, QUARTERS or TOKENS—all or in various combinations, are paid into the *one* coin-slot—the different values being instantly assured your treasury.

MONEY METERS are furnished in either *portable* or *stationary* form and are mechanically unbeatable for trolleys and buses.

This *at-the-source* protection will probably add 4% to 10% to your present passenger income.



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When ordering new seats or in recovering present equipment specify General Leathers.

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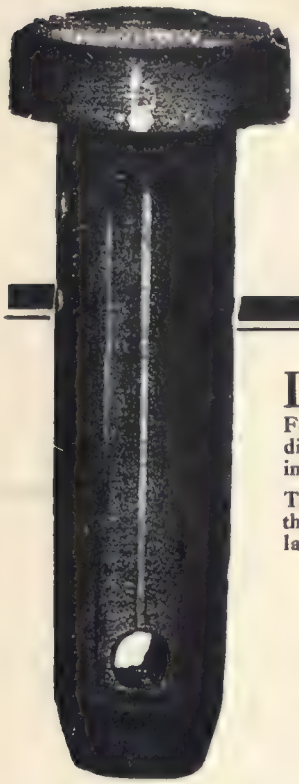
Novelty Electric Co. Philadelphia, Pa.

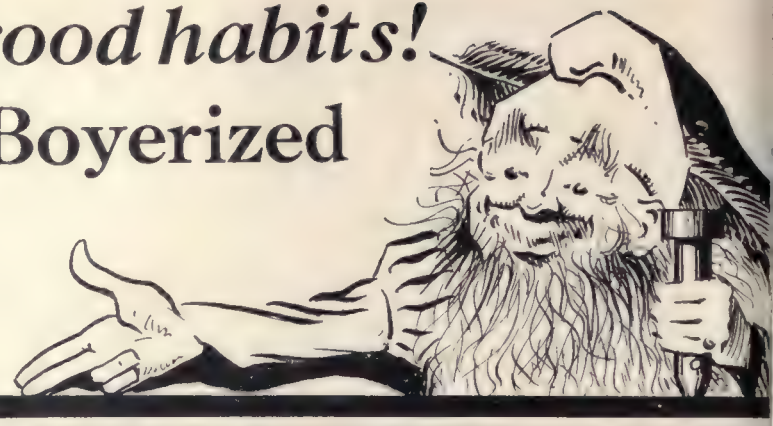
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DECISIONS made to continually lower maintenance costs by specifying quality materials are well grounded in practical experience. For here is a two-fold economy, the long life of the part gives you a direct saving by more mileage between repairs, and this increased interval decreases labor costs.

That is the kind of economy found in all Boyerized Parts. Specify them at all times for the Boyerizing special treatment makes them last three to four times longer than ordinary parts.

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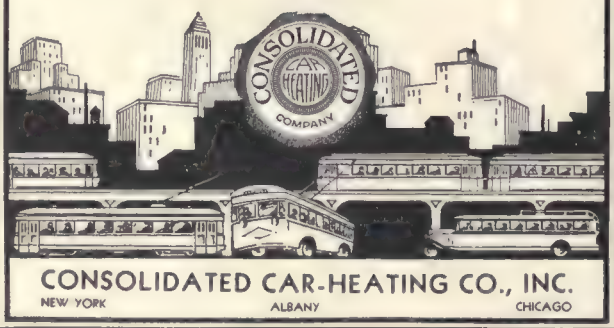
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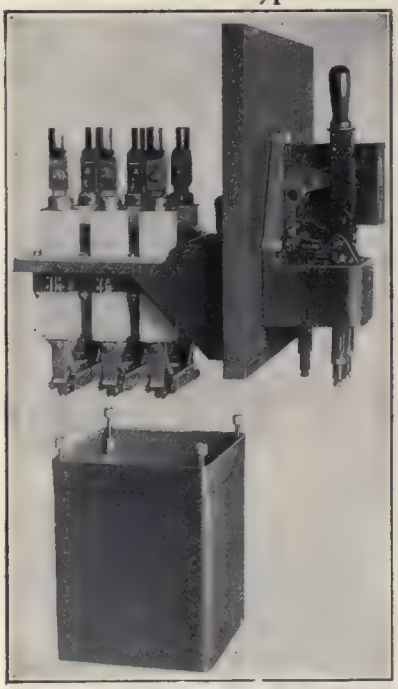
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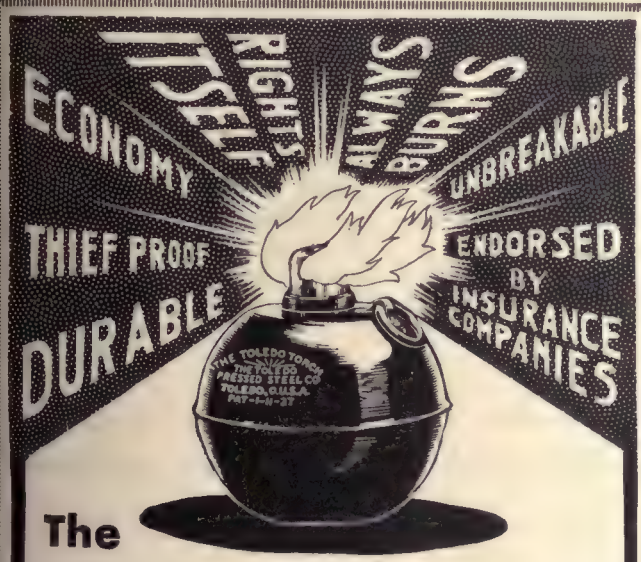
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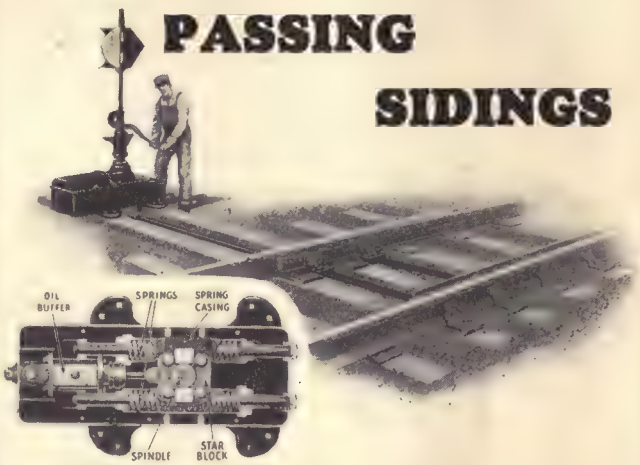
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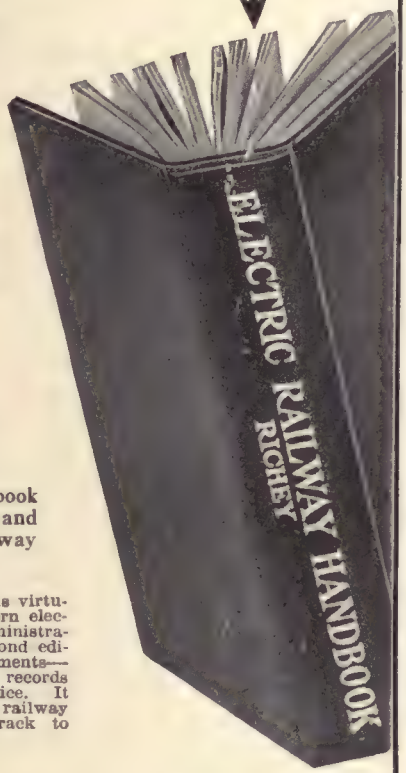
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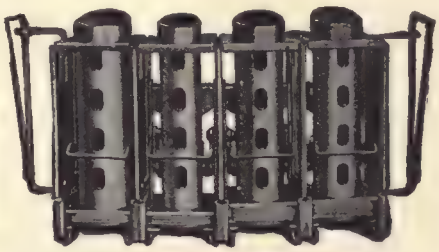


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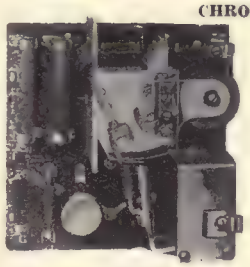
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STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912

Of Electric Railway Journal, published monthly at New York, N. Y., for October 1, 1930.

State of New York } ss.
County of New York }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared C. H. Thompson, who, having been duly sworn according to law, deposes and says that he is the Secretary of the McGraw-Hill Publishing Company, Inc., publishers of Electric Railway Journal and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

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C. H. THOMPSON, Secretary.

McGRAW-HILL PUBLISHING COMPANY, INC.

Sworn to and subscribed before me this 30th day of September, 1930.

[SEAL] H. E. BEIRNE.

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ALPHABETICAL INDEX

This index is published as a convenience to the reader. Every care is taken to make it accurate, but *Electric Railway Journal* assumes no responsibility for errors or omissions.

Allied Engineers 76
Aluminum Co. of America ..... Insert 57-58
American Brake Shoe & Foundry Co. 72
American Bridge Co. 73
American Brown Boveri Co., The 55
American Car Co. ..... Third Cover
American Steel & Wire Co. 37

Beeler Organization 76
Bemis Car Truck Co. 74
Bender Body Co., The 82
Bethlehem Steel Co. 16
Bibbins, J. Roland 76
Brill Co., The J. G. ..... Third Cover
Buchanan & Laying Corp. 76
Byllesby Eng. & Manag. Corp. 76

Carnegie Steel Co. 30
Cities Service Co. 36-37
Collier, Inc., Barron G. 28
Consolidated Car Heating Co. 74

Dayton Mechanical Tie Co., The 24-25
De Vilbiss Co., The 38
Differential Steel Car Co. 49

Electric Service Supplies Co. 13
Electric Storage Battery Co., The 41

Fargo Motors Corp. ..... Front Cover
Ford, Bacon & Davis 76

General Car & Coach Corp. ..... Insert 28A-28D
General Electric Co. 18-19-20
General Leather Co. 72
General Motors Truck Co. ..... Insert 45-48
General Steel Castings Co. 68
Globe Ticket Co. 44
Goodrich Rubber Co., The B. F. 43
Goodyear Tire & Rubber Co. 23

Hale-Kilburn Co. 15
Hemingray Glass Co. 68
Hemphill & Wells 76
Heywood-Wakefield Co. 31
Hyatt Roller Bearing Co. 22

Illinois Steel Co. 63
International Register Co., The 68
International Steel Tie Co. 52-53

Jackson, Walter 76
Johns-Manville Corp. 35
Johnson Fare Box Co. 77

Kelker, Jr., R. F. 76
Kuhlman Car Co. ..... Third Cover

Long Mfg. Co. 64
Lorain Steel Co. 51
Louisville Frog, Switch & Signal Co. 81

McGraw-Hill Book Co., Inc. 77
Mergott Co., The J. E. 75
Metal & Thermit Corp. 26-27

Mica Insulator Corp. 40
Miller Trolly Shoe Co. 29
Money-Meters, Inc. 72

Nachod and U. S. Signal Co. 70
National Bearing Metals Corp. 69
National Brake Co., Inc. 21
National Carbon Co. 42
National Paving Brick Co. 69
National Pneumatic Co. 17
National Tube Co. 61
New Jersey Wood Finishing Co. 33

Oakite Products, Inc. 80
Ohio Brass Co. 8-9
Ohmer Fare Register Co. 71
Okonite Co., The 73
Okonite-Callender Cable Co., The 73

Pantasote Co., Inc., The 70

Railway Track-work Co. 6-7
Railway Utility Co. 77
Ramapo Ajax Corp. 75
Richey, Albert 76
Roebling's Sons Co., John A. 71
Roller-Smith Co. 74

S.K.F. Industries, Inc. 60
Safety Car Devices Co. 54
Sanderson & Porter 76
Searchlight Section 78-79
Standard Oil Co. (Indiana) 50
Standard Oil Co. of New York 62
Standard Steel Works Co. 59
Star Brass Works, The 66
Stoody Co. 14

Taylor-Wharton Iron & Steel Co. 70
Timken-Detroit Axle Co. ..... Back Cover
Timken Roller Bearing Co. 39
Toledo Pressed Steel Co. 75
Tuco Products Corp. 71
Twin Coach Corp. ..... Insert 11-12

Union Metal Mfg. Co., The 65
Union Switch & Signal Co. 66
Universal Lubricating Co. 67

Wason Mfg. Corp. ..... Third Cover
Westinghouse Elec. & Mfg. Co. ..... Second Cover, 4-5
Westinghouse Traction Brake Co. 10
Wish Service, The P. Edw. 76

Yellow Coach ..... Insert 45-48

Searchlight Section — *Classified Advertising*

EQUIPMENT (Used, etc.)
Central Illinois Public Service Co. 79
Connecticut Co. 79
Crawbuck Co., John D 79
Duie Pyle Contr. Co., A 79
Perry, Buxton, Doane Co., The 79
Schiavone, L. & Bonomo Bros., Inc. 79
Stirewalt, N. C. 79
POSITIONS VACANT AND WANTED 78

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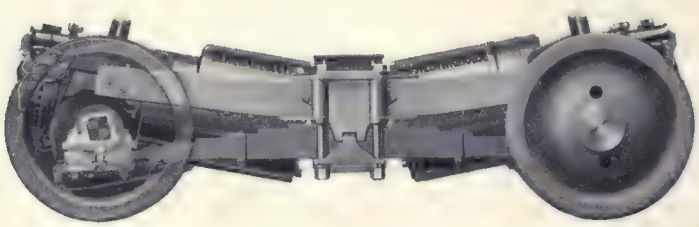


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ELECTRIC RAILWAY JOURNAL

v-Hill Publishing Company, Inc. DECEMBER, 1930 Thirty-five Cents per Cop



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Vol. 74, No. 13 *Pages 729-786*

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1930

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LONDON, *6 Bouverie Street, London, E. C. 4*

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Contents of This Issue

DECEMBER, 1930

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Editorials 729

Research Department Aids Railway Operations 732

Knoxville Trolley Buses Increase Patronage 735

Extensive Rehabilitation Places Des Moines in Favorable Position 736
By LAURENCE WINGERTER

Higher Revenues with Lower Fares 739

Philadelphia Sample Car Uses Single-Reduction Drive with High-Speed Motors and Magnetic Brakes 741

Washington Experiments with Street Markers 742

Co-ordination of Transit Facilities Proposed for St. Louis 743

Development of the Bus for Mass Transportation 745
By A. T. WARNER

Reliability Features Reading's Power Supply 747
By C. L. DOUB

More Power 750
By J. W. WELSH

Pittsburgh Traffic Signal Controlled by Street Car Movement 752

Trolley Bus Operation Proves Advantageous at Detroit 753

Heating Passenger Trains on Electrified Steam Railroads 755

Richey Fare Index Revised 756

Regenerative Equipment Planned for Paris Tramcars 757

Monthly and Other Financial Reports 760

A.E.R.A. Executive Committee Meets in New York 761

Cleaning Cars and Equipment by Sand Blast 762

Maintenance Notes:

Insulation Tested with Portable Transformer—*By A. Taurman* 763

Bus Wheels Removed with a Simple Clamp—*By C. B. Hall* 763

Pump and Heater Facilitate Transmission Filling—*By Leonard S. Rose* 764

Radio Interference from Cars Eliminated by Choke Coil—*By A. S. Warner* 764

Work Car Equipped to Spread Material Along Track 765

Remodeling Cars for One-Man Operation 765

Testing Air Governors—*By E. S. McGinnis* 766

Insulating Paste for Bolt Heads—*By E. V. Lackey* 766

Economical Rerailing at Atlanta—*By D. S. Berman* 766

New Products for the Railways' Use 767

News of the Industry 771

QUANTITY *production* makes QUALITY *practical*



PRESERVE

the thoroughbred strain *with Westinghouse Renewal Parts . . .*

WHEN you chose Westinghouse equipment you picked a thoroughbred. When you make replacements with renewal parts manufactured outside the Westinghouse walls you are weakening the thoroughbred strain. Regardless of the quality of the material and the careful design that go into the construction of the renewal part, if the work is done without the original drawings, specifications, and tools, a perfect reproduction can hardly be expected. The piece may *work* but, after all, almost any horse can run—it took generations of careful breeding to produce a Man-o-war.



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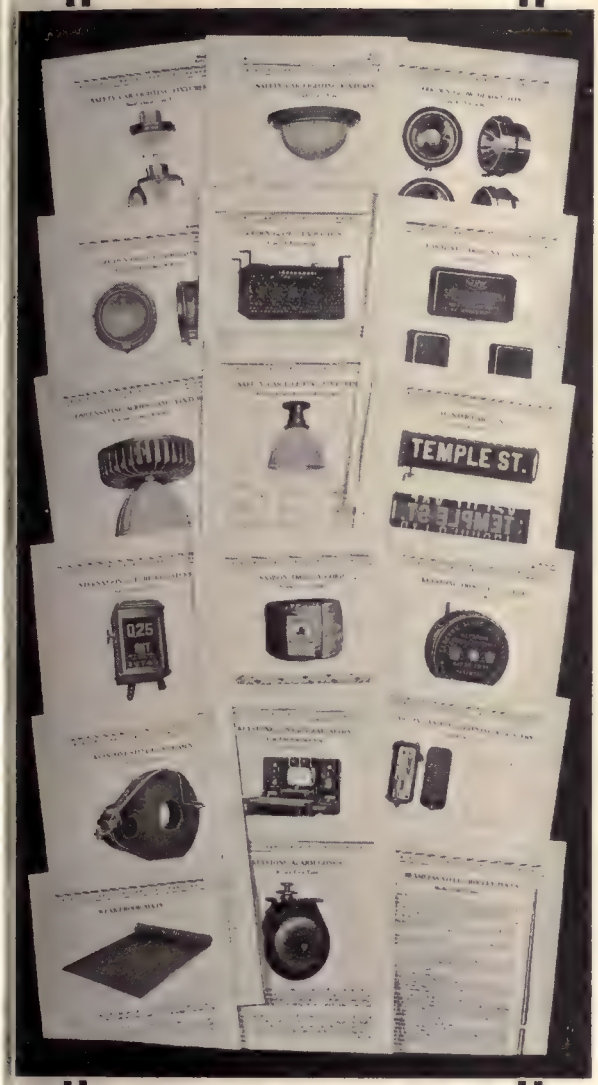
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Service, prompt and efficient, by a coast-to-coast chain of well-equipped shops

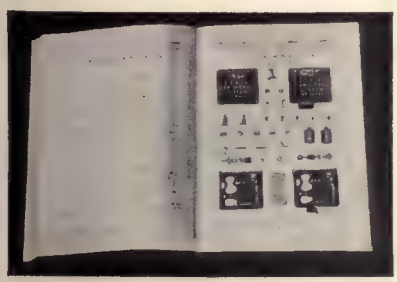
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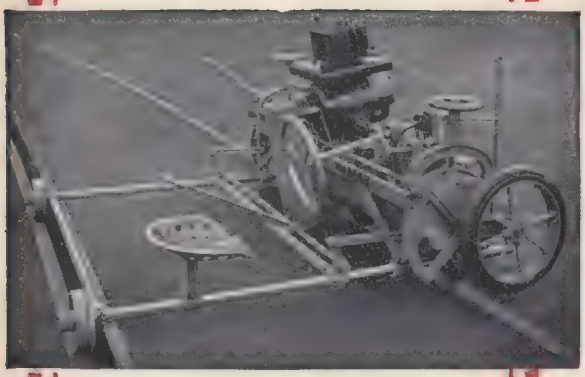
Keystone electric railway car equipment is installed on the finest of modern cars. A representative car is Keystone-equipped throughout, from trolley wheel to the Golden Glow Headlight on the front end. Keystone specialties include gear-cases, trolley poles and cords, trolley catchers, lighting fixtures, signal systems, alarms, fare registers, etc., etc.

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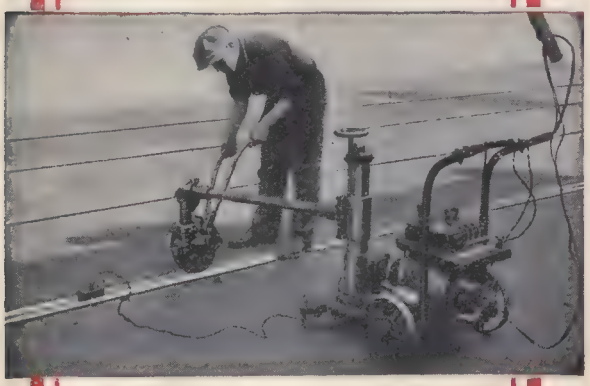
ELECTRIC SERVICE SUPPLIES CO. Manufacturer

RAILWAY, POWER AND INDUSTRIAL ELECTRICAL MATERIAL

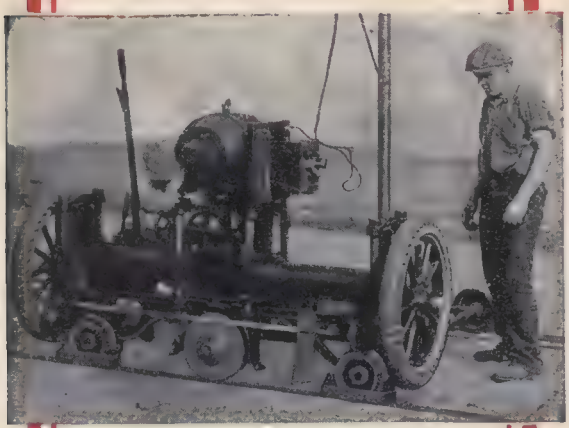
Home office and plant at 17th and Cambria Sts., PHILADELPHIA; District offices at 111 N. Canal St., CHICAGO; 50 Church St., NEW YORK; Bessemer Bldg., Pittsburgh; 88 Broad St., Boston; General Motors Bldg., Detroit; 316 N. Washington Ave., Scranton; Canadian Agents, Lyman Tube and Supply Company, Ltd., Montreal, Toronto, Vancouver.



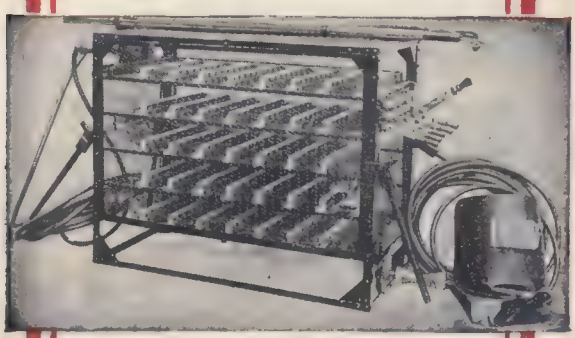
Improved Atlas Rail Grinder



Eureka Radial Rail Grinder



Imperial Track Grinder



Ajax Electric Arc Welder

Old-time roads cannot carry new-day traffic

Yesterday's highways couldn't carry to-day's motor cars, but yesterday's rails can carry to-day's street cars.

It's much easier and cheaper to restore the youth of old rail than to rejuvenate an obsolete highway.

All that's needed is suitable modern equipment—such as the rail grinders and arc welders here displayed for your selection.

Railway Track-work Co.

3132-48 East Thompson Street, Philadelphia

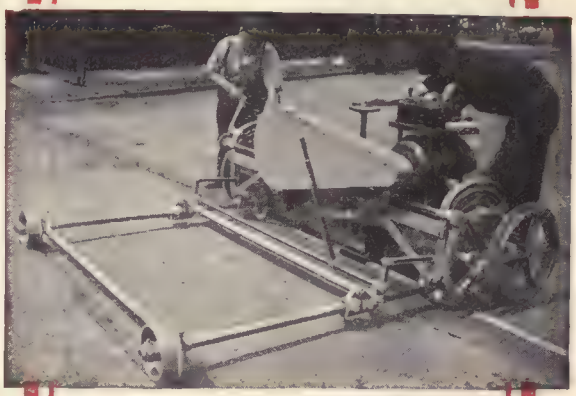
AGENTS

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Chas. N. Wood Co., Boston
H. F. McDermott, 208 S. LaSalle St., Chicago
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3571



Reciprocating Track Grinder



Vulcan Rail Grinder

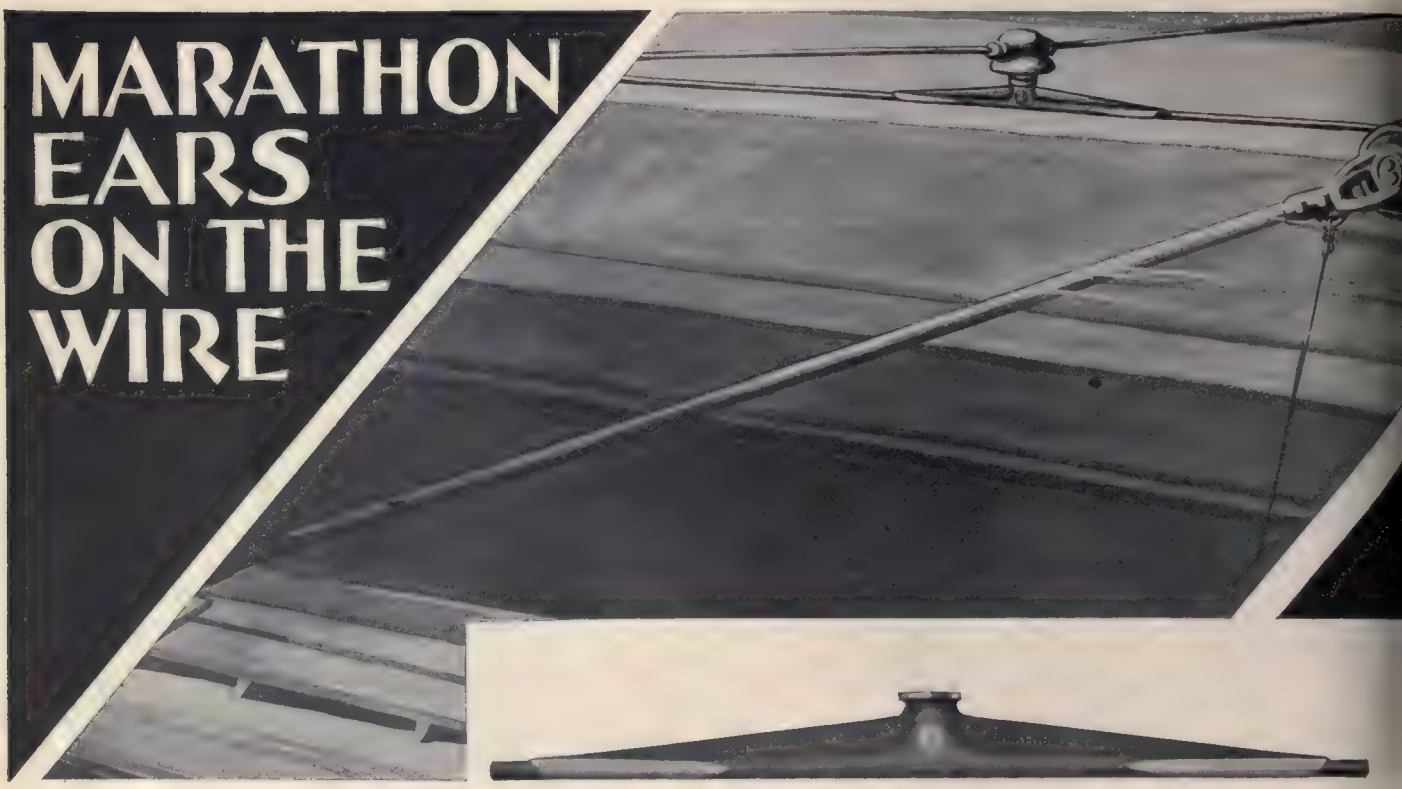


Reciprocating Grinder Car, showing one of the grinding units.



RTW Curve Oiler

MARATHON EARS ON THE WIRE





The Old Type Ear **The *Improved* Marathon Ear**

These sections of ends tell the story. The abrupt approach and leave has given way to the taper with the result that the wheel passes smoothly and steadily across the ear without bumping, bouncing or arcing.

THE introduction of the *improved* Marathon Ear three months ago has awakened a most active interest among electric railway men. Never has O-B introduced a new product which received any greater evidence of approval—not even excepting the exceedingly popular original Marathon Ear, introduced in 1923.

One Missouri property changes from its customary brand and orders four hundred *improved* Marathons; a large property in Alabama recognizes the advantages of the tapered approach and orders one thousand *improved* Marathons; a Canadian property foresees the reduced wear on ears, wire and wheels and orders fifteen hundred *improved* Marathons; two Pennsylvania properties send in large orders based on the obvious excellence of *improved* Marathons. Concrete evidence comes from scores of properties that *improved* Marathon Ears have "taken".

An early investigation on your part might properly lead to the conclusion that *improved* Marathon Ears will likewise reduce costs on your property. Ask your O-B Salesman, or see page 44 of New Products Supplement No. 4 to O-B Catalog No. 20 for complete description and ordering information.



AMONG the most important of the recent rehabilitation programs to be completed is that of the Windsor, Essex & Lake Shore Electric Railway. This property extends from Windsor to Leamington, Ontario—a distance of thirty-six miles—and is operated by the Hydro Electric Power Commission of Ontario. Complete rehabilitation of track, overhead and rolling stock has been effected, with a resultant increase in operating efficiency.

Indicative of the operator's efforts to keep operation and maintenance costs at a minimum was their selection and use of 13,000 O-B Titon Rail Bonds. This choice was made after exhaustive service tests and was influenced somewhat by the excellent performance records of Titon Bonds on many other properties.

O-B Titon Bonds are installed by copper electrode arc welding and are applied to the head of the rail with O-B Duron Welding Rod. A copper sleeve, which distributes and dampens out vibrations and adds to the life of the bond, surrounds the wire inside the terminals. The design of the terminals permits beveling of deposited metal from the rail so as to escape wheel contact. Thus is the service life of the bond materially lengthened.

O-B Titon Bonds are fully described on page 667 of O-B Catalog No. 20. Other types of O-B Bonds will be found in the same section.



The O-B Titon Bond, showing terminal construction. Note copper sleeves surrounding strand ends inside of terminal.



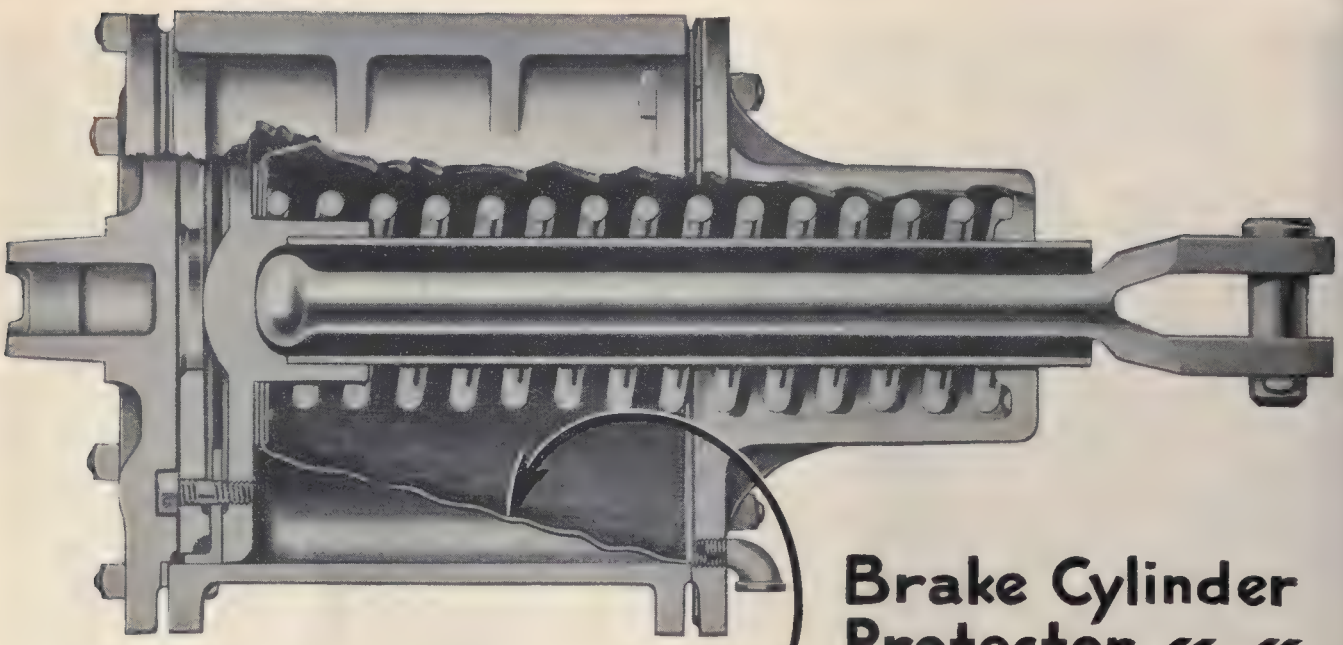
Twenty-four pages of New Products Supplement No. 4 to O-B Catalog No. 20 are allotted to bonds and bonding equipment. If you do not have a copy, write for one.

Ohio Brass Company, Mansfield, Ohio
Canadian Ohio Brass Company, Limited
Niagara Falls, Canada
1332BL

Ohio Brass Co.

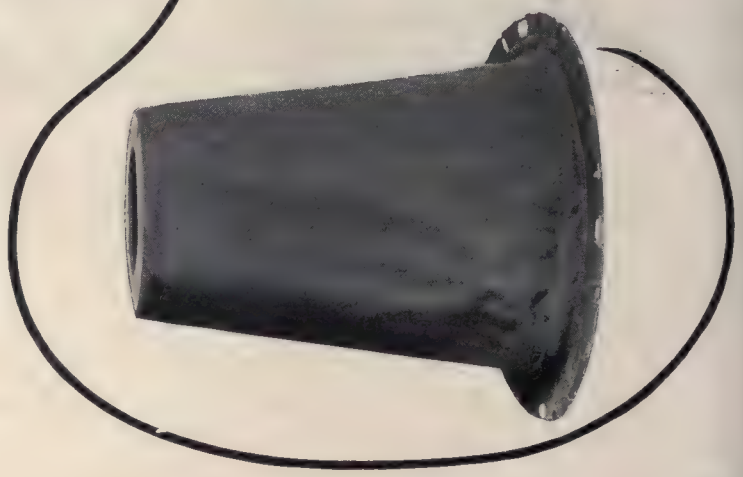
NEW YORK PHILADELPHIA PITTSBURGH BOSTON CHICAGO CLEVELAND ST. LOUIS ATLANTA DALLAS LOS ANGELES SAN FRANCISCO SEATTLE

PORCELAIN INSULATORS
LINE MATERIALS
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Brake Cylinder Protector « «

A TRAP for Destructive DIRT « «



THIS protector—a collapsible water-proof hood—when inserted in the brake cylinder as shown, traps dirt and moisture that may enter at the non-pressure head, and prevents them from reaching the cylinder walls » » The advantages of this protection are that the lubricant is preserved, leakage reduced, life of packing cup lengthened, and maintenance expense lessened » » ***Are your brake cylinders thus protected?***

WESTINGHOUSE TRACTION BRAKE CO.

General Office and Works

WILMERDING PENNSYLVANIA

Better Track Layouts Mean Better Barn Operation



THIS excellent example of LORAIN work replaces a portion of a carbarn layout manufactured in the year 1897 by the Lorain Steel Company's predecessor, The Johnson Company. The original work was constructed of 70-lb. 7-inch high tee rail, having separate bolted-on guard rails in the curves. An additional double-slip switch was installed ten years ago, and one year ago, a portion of the layout adjoining the far end of our illustration was replaced. But the part just taken out to make way for the new work before us had been in constant use for thirty-three years. This renewed carbarn layout is now constructed of 7-inch girder guard rail with solid cast steel tongue switches, mates and frogs, making the complete outfit include three double and seven single slip switches, and two single branch-offs.

33 Years of Service Proved the Correctness and Efficiency of This Installation

For sound design in complicated trackwork, especially where layouts must withstand hard use over long periods and remain satisfactory, street railway men today, as in 1897, look to LORAIN.

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The Lorain Steel Company

General Offices: 545 Central Avenue, Johnstown, Pa.

Subsidiary of United States Steel Corporation

Sales Offices: Atlanta Chicago Cleveland Dallas New York Philadelphia Pittsburgh

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Export Distributor: United States Steel Products Company, 30 Church St., New York City, N. Y.

LORAIN

SITTING STILL IS PROFITABLE

Most people picture hustle and bustle when thinking of a profitable business. But the restful, still-sitting passenger certainly leads to a profitable operation for the electric railway. In your own advertising (if you are not already doing so) call the passengers' attention to the rest and ease found in your seats. And be sure to provide that comfort by installing Hale & Kilburn equipment.



Another variation of the Hale & Kilburn No. 909 seat for single end cars or motor buses.

HALE & KILBURN SEATS

HALE & KILBURN CO.

General Offices and Works: 1800 Lehigh Ave., Philadelphia

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STOODY MANGANESE WELDING ROD

Deposits 12 to 14% manganese steel which is clean, close grained, sufficiently hard and surprisingly tough.

Furthermore, the deposit is made with the least possible heat (from 100 to 125 amperes and 20 to 25 volts when the application is made electrically). Consequently the parent metal on which the deposit is made remains uninjured.

You Should Standardize on Stoody Manganese Welding Rod and Lengthen the Life of Your Special Track Work

STOODY COMPANY

Manufacturers of

Welding Rod ◆ Alloy Steels ◆ Equipment

WHITTIER, CALIFORNIA

IN 1914

the joints were "shot" but they had the courage to try to save this rail . . .



Actual photo of rail welded in 1914 and recently taken out on Third Avenue Railway System, New York City.

METAL & THERM

Pittsburgh Chicago Albany 120 BROADWA

IN 1930

he rail was worn ut after sixteen nore years un- ler heavy city ervice . . .

IT TOOK courage, back in 1914, to spend good money for Thermit-welding track in which the joints were already badly worn. Thermit had not then won the recognition it now possesses. It was still generally considered an experiment in America. It is to the credit of the officials of Third Avenue Railway System of those days, that they recognized an opportunity. The rail itself was still good, but the joints were "shot." And so they decided to Thermit-weld. They took a courageous step to save money by spending money.

And what a return this investment paid! Think of street car track, in front of the General Post Office in the heart of New York City, rejuvenated by Thermit-welding in 1914 and then lasting until 1930. Many a road has laid new track since 1914 and has had to replace it already, even under lighter traffic conditions. Why? Because the joints which are the weak spots in every piece of track are often neglected.

Thermit-welding is really most economical. It eliminates the weak spots by eliminating the joints.

New track—laid with Thermit joints will last longer and cost less to maintain. Joint repairs will be practically nil.

Old track—can be saved for years of further useful life by Thermit-welding every joint. It will ride more smoothly and wear more evenly.

Now is the time to save by spending money—carefully! Let us make a survey of the rail joint situation on your property and offer a Thermit-welding maintenance plan. No obligation involved.

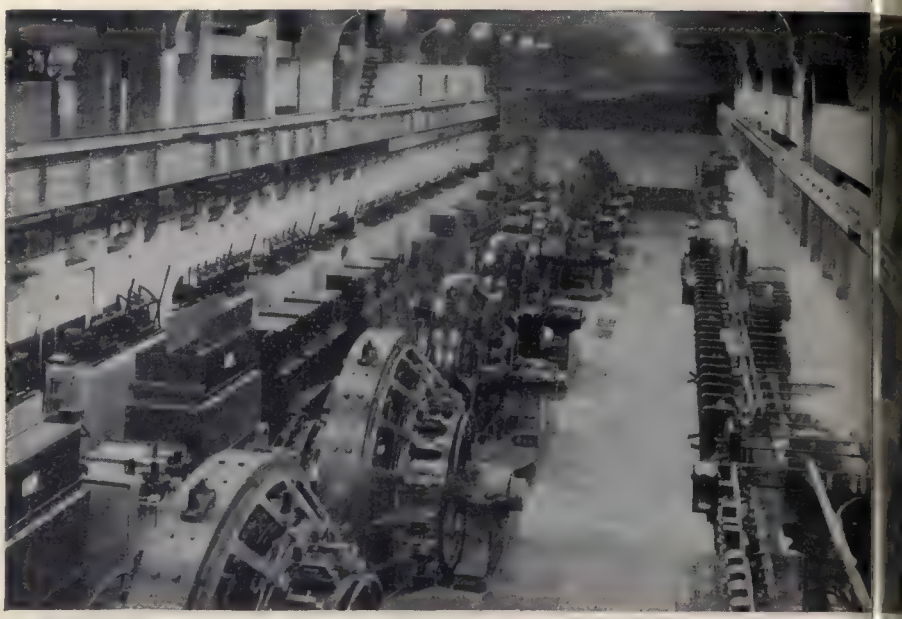


CORPORATION

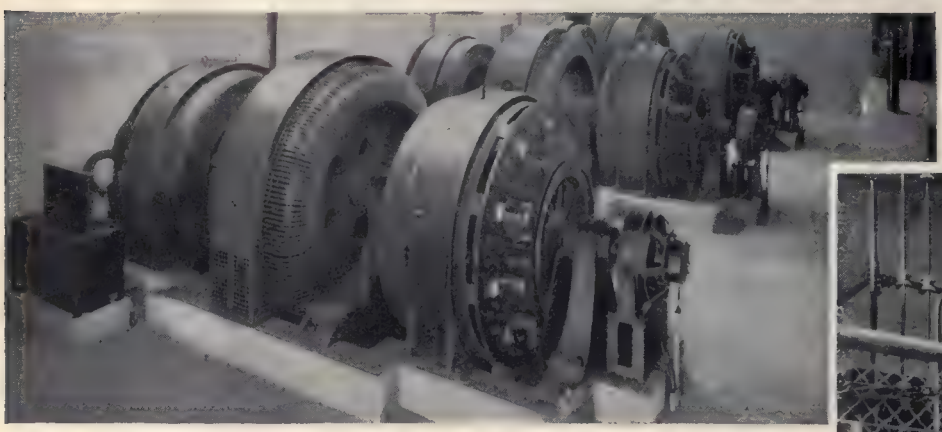
NEW YORK, N.Y. South San Francisco Toronto

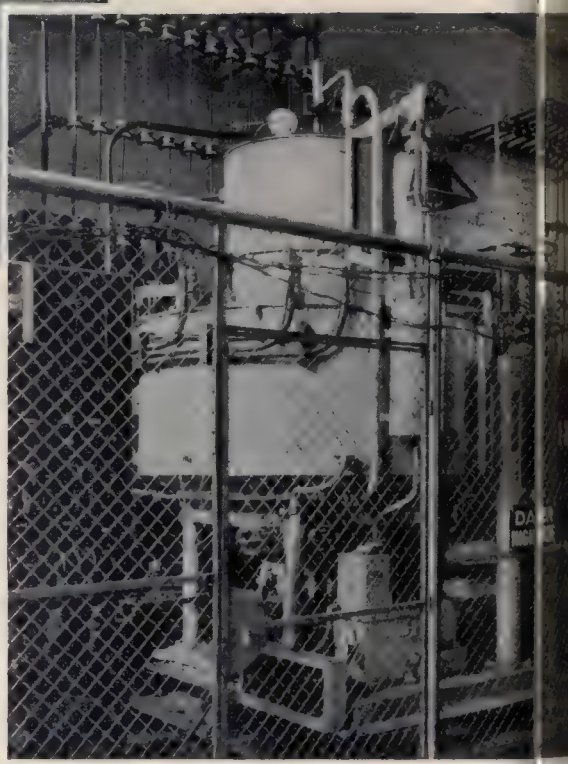
Reliable Power—

GRAND CENTRAL SUBSTATION of the New York Central Railroad is located 100 feet below the street level at Forty-third Street and Lexington Avenue. The equipment includes ten G-E synchronous converters, several being of 4,000-kw. capacity, and G-E manual switchgear



The CLEVELAND UNION TERMINAL electrification is supplied with power through two G-E equipped automatic substations. Substation No. 1 includes three 3-unit, 3,000-kw., 3,000-volt, direct-current synchronous motor-generator sets complete with automatic and supervisory switchgear





The DELAWARE, LACKAWANNA AND WESTERN railroad electrification is supplied with 3,000-volt direct current through 13 G-E mercury-arc rectifier units ranging in capacity from 1,500-kw. to 3,000-kw. The transformers and switchgear are also of General Electric manufacture.

JOIN US IN THE GENERAL ELECTRIC PROGRAM, BROADCAST EVERY SATURDAY EVENING ON A NATION-WIDE N. B. C. NETWORK

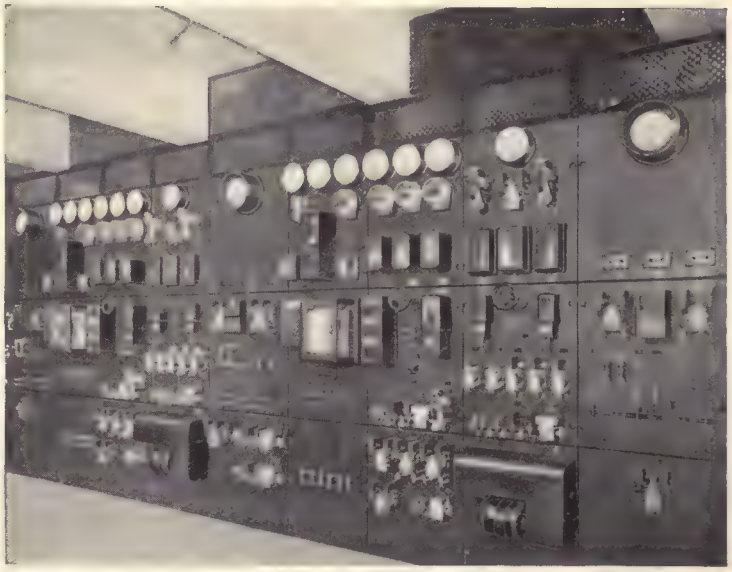
GENERAL

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y.

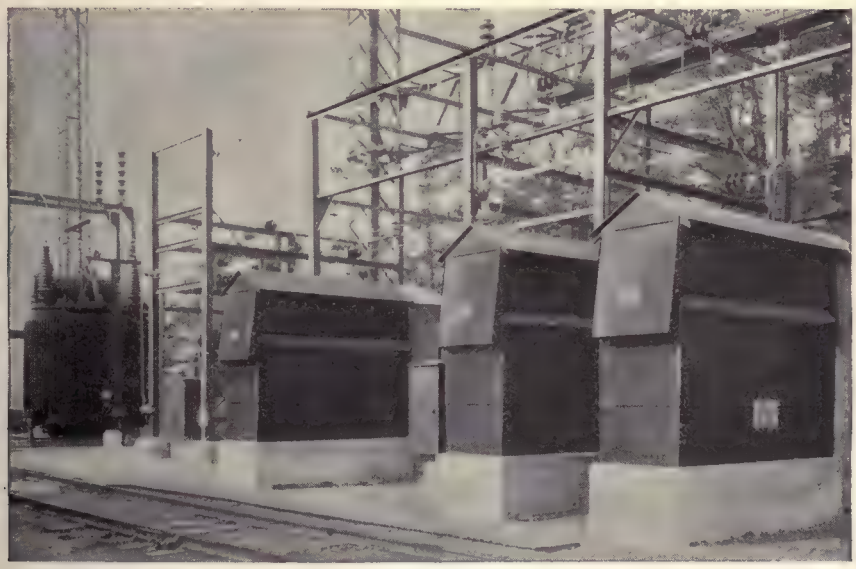
Reliable Control



INNATI, OHIO, 19 G-E equipped automatic substations E supervisory control form the largest completely c trolley power system in the world. The illustration ws the interior of one of the single-unit stations



The CLEVELAND UNION TERMINAL electrification includes a large amount of G-E automatic switchgear. The panels illustrated control the three 3,000-kw., 3,000-volt synchronous motor-generator sets in substation No. 1



The PENNSYLVANIA railroad electrification is equipped with sixty G-E 11,000-volt, high-speed, circuit breakers, and twenty-five more units have been ordered. The READING COMPANY also plans the installation of forty similar equipments

To meet every electrical requirement of railroad operation, General Electric manufactures motor-generator sets, synchronous converters, and mercury-arc rectifiers complete with control equipment for manual, semiautomatic, or full-automatic operation.

The long, comprehensive experience of G-E engineers qualifies them to analyze your power problems and to recommend equipment that is certain to result in improved operation and greater economy. You can obtain complete information from the nearest G-E office.

130-29

ELECTRIC

SALES AND ENGINEERING SERVICE IN PRINCIPAL CITIES

Compare Your Operating Costs with These—

SOME ESTIMATED OPERATING COSTS OF THE 40-PASSENGER TROLLEY BUS

	Cents per bus mile
Maintenance of electric equipment	0.5 to 0.7
Maintenance of overhead lines	0.6 to 0.9
Electric power	2.3 to 2.6
Car house	1.0 to 1.4
TOTAL	4.4 to 5.6

THE unusually low maintenance and operating costs of the 40-passenger trolley bus are an advantage of the very first importance to every operator. Add to this, automatically smooth, fast acceleration, maneuverability in traffic, electric heating, and quietness, and you have the reason why so many operators are considering this modern vehicle. General Electric is prepared to furnish complete electric equipment for trolley-bus operation, including air brakes and line material. Ask your nearest G-E office to give you further information.

Join us in the General Electric program, broadcast every Saturday evening on a nation-wide N. B. C. network



G-E equipped trolley bus in Knoxville, Tenn.

330-154

GENERAL ELECTRIC

SALES AND ENGINEERING SERVICE IN PRINCIPAL CITIES

Electric Railway Journal

Consolidation of
Street Railway Journal and Electric Railway Review
A McGraw-Hill Publication—Established 1884

JOHN A. MILLER, JR., *Editor*

Volume 74 New York, December, 1930 *Number 13*

Santa Claus: His Name Is Service

IN THE welter of comment on the recent election about the attitude of the Pinchots, the Roosevelts, the Crosses and other gubernatorial and minor candidates toward the utilities, sight has almost been lost nationally of the significance to the electric railways of the results of the referendums in the state of California, in San Francisco, in Boston and in Omaha. In several of these places the issue was hotly contested, but in every instance the outcome was favorable to the transportation companies.

In California the plan to revise the state tax on electric railways was approved. This measure is significant in that the electric railways will be taxed in the future at a rate more in proportion to that of other utilities and to private property. In San Francisco both the issue to limit the fare on the municipal railway and the one to extend the franchise of the Market Street Railway for twenty-five years were hotly contested. The Municipal Railway proposal was defeated. The franchise extension won. Even the stoutest local advocate of municipal ownership was forced to admit that municipal ownership of the railway had reached the deficit stage and that in all likelihood the deficit would become progressively larger.

The worst that the loudest opponent of the Market Street Railway could say against that company was that "the Market Street Railway has now for years been working itself into the good graces of the people—giving good service and especially giving courteous service, looking out for every little angle that means pleasing the public." This, indeed, was a trying situation. As the *Wall Street Journal* so aptly said, it showed how the "interests" are ever devising new schemes to exploit the public.

In Boston the voters had the choice of returning the system to private ownership and management, continuing public control, or going to municipal ownership. A substantial majority was returned for the present plan of public control. There, too, the issue was vigorously contested. Each proposal had its renowned adherents. The advocacy was forensic but seldom vituperative. Now the Legislature, by mandate of the people, has been definitely appraised of the feeling of the public in the district served by the Elevated. The result is to lift the perennial debate over the Elevated out of the arena of politics and place the mass-transportation system of Boston in a position to build safely, strongly, and well.

In Omaha the plan to construct a competing bridge over the Missouri River to parallel the structure of the Omaha & Council Bluffs Street Railway was defeated. Here again virtue is its own reward, for the vote is one indicating confidence in the present management policies for the railway as laid down by President Shannahan and his associates.

By amendment to the constitution of the state of Utah, a tax commission was created in whose hands will be placed the task of assessment of all public utilities. Formerly utilities serving communities within a single county were assessed by the county assessor. This charge should result in more equitable utility taxation throughout the state.

Judged by these referendums and the outcome of the vote in Chicago earlier in the year, if there is any Santa Claus for the electric railways where public issues are involved, his name is Service.

Naming the New Baby

CARE always should be exercised in christening a new baby, as the name given in infancy cannot well be changed in later life. That is true also of a new type of transportation vehicle, and it would be well at this time to devote some thought to the latest development—the rubber-tired vehicle propelled by electric motors deriving their energy from an overhead contact line.

More than a decade ago, a vehicle having a certain similarity to the present vehicle, yet in reality quite different, became known as the trackless trolley. Opinion is practically unanimous that this unattractive name should be relegated to the scrap heap, where many of the original vehicles have already gone.

Several names have been suggested for the modern type of equipment. Among them are electric coach, electric bus, trolley coach and trolley bus. Good reasons exist for not using either of the first two. Confusion would inevitably arise from the similarity of the terms gas-electric bus and electric bus. Moreover, the vehicle actually is not an electric bus or coach. Those names properly belong to vehicles deriving their power from storage batteries. While few storage-battery buses are in service any longer, there are a sufficient number of storage-battery trucks to perpetuate the association between the name electric vehicle and storage-battery operation. Most important of all, however, is the reason that the public would be unlikely to adopt any such name. Were it adopted by the local transportation industry, it seems probable that the public would ignore it and use the old and undesirable appellation, trackless trolley.

Between the names trolley coach and trolley bus, there is not much to choose. Both describe the vehicle with reasonable accuracy. Endless arguments have been waged concerning the exact meaning of coach and bus. A hundred years ago, it may have been true that a coach was an imposing and elegant vehicle to carry the gentry on their travels, while a bus was a cheap, crude omnibus for the accommodation of the common herd. Nowadays, however, no such distinction exists. The steam railroads

use the word coach to distinguish an inferior class of accommodation as compared with the Pullman car. On the other hand, a number of electric railways use the term motor coach to distinguish a type of service superior to that given by the ordinary bus.

In England, where this type of vehicle has been widely used for some years past, the term trolley bus is universally used. Practically all the electric railways in the United States operating this kind of service call it a trolley bus. The manufacturers of the vehicles and the equipment required for their operation are virtually unanimous in favoring the name trolley bus. All things considered, it appears that the term trolley bus best fits the vehicle and is most likely to be adopted by the public if used by the industry.

Manufacturers Show Confidence in the Industry

REAFFIRMING their faith in the elemental soundness of the electric railway industry, the manufacturers' representatives attending the recent meeting of the A.E.R.A. Convention Exhibit Committee promised to take as much or more space in 1931 as was used by their companies in 1929. Coming after a period of prolonged depression, and at a time when the industrial horizon is still clouded with elements of doubt and uncertainty, the decision was a courageous one. There was no hesitation, no equivocation. A full year in advance of the event the members of the committee, representing a score or more of the leading manufacturers put themselves on record by underwriting the success of the exhibit of the 50th annual convention.

This action of the committee is more than a mere gesture of confidence. It is a definite expression of faith on the part of hard-headed, calculating business men. It indicates a belief in the early restoration of the buying power of this industry. As any increase in buying power of the railways is predicated upon an increase in revenue which can come only with business recovery, it may be assumed that the manufacturers, taking a broad view of the situation, look for an early end of the present depression.

The electric railways were among the last to feel the effect of the decline. It does not follow, however, that they will be among the last to recover. It is not too much to hope, in fact, that they may be among the first to get back to normal. The courageous action of the exhibit committee in planning for a record exhibit of electric railway materials is a step in this direction.

Making Faster Street Car Operation Practicable

WITH general street traffic in the larger cities becoming more and more congested the need for public transportation vehicles that can fight their way successfully through the maze and maintain speeds as high as or higher than the average on the street becomes daily more apparent. The street car, while its maximum speed is more than ample for city conditions, is handicapped by the characteristics of the motor that prevent acceleration at a high rate up to anywhere near the top speed.

More power on the street car undoubtedly would be of material advantage, not only in permitting a higher initial acceleration, but in maintaining that rate long enough to bring the car up to the maximum permissible speed, thus not only allowing the car to keep up with the procession of automobiles but allowing it to take advantage of any opportunities to get ahead. Electric railway men usually have put aside the idea on the basis of cost. Not only are larger and heavier motors required, but the power demands and the energy cost will certainly be greater. However, as J. W. Welsh shows in this issue, the extra cost may well be made up by a reduction in the labor charge by virtue of the faster schedule. With the present trend toward lower car weights, there may be the possibility of getting the higher accelerations demanded with no great increase in the power drawn from the line.

Series motors have been used for street railway power so long that few engineers consider any other type suitable. From time to time inventors have urged modifications of the series motor for the purpose of obtaining regenerative control, with a return of energy to the trolley. These plans have been so complicated that none of them ever has come into general use. However, the plan being tried in Paris, France, and discussed in this issue indicates that a way has been found to use compound motors which not only is less complicated than the older plans for regeneration, but which will give a more satisfactory control of speed and power than series motors will permit. Furthermore, it has the advantage of regeneration without any special attention on the part of the motorman.

These new developments indicate that the entire subject of railway motors may well be opened up once more. Certainly the need exists for equipment that will not block the streets. The possibilities of such plans as these, or of other plans that may be devised under the spur of competition, merit the most earnest consideration.

Seattle's Municipal Railway in Insolvent Condition

SEATTLE'S attempt to run its railway has failed and failed miserably. It did not need the recent report of the citizens' committee to make that plain. That was patent long ago. But it did take the report of the citizens' committee to establish the extent of the failure. Seattle's municipal railway is in an insolvent condition. There has been too much public pressure. But the situation is not without hope. According to the committee, the system should be placed in the hands of an operating body as free as possible from public pressure.

The committee suggests almost an entirely new deal for the system—a deal that takes cognizance of relief for the railway from paving burdens and other onerous charges. This is significant to private companies seeking relief from similar imposts on the score of their unfairness. The most significant thing, however, is that the city has failed in its attempt to amortize the purchase price out of earnings. That it would so fail was a foregone conclusion, but now the fact has been established beyond the possibility of a quibble.

But after all the crowning presentment of the committee was the statement that the whole trend of government for the last half century has been to make all government more responsive to the public. This may be all right in government, but not necessarily in business.

And then the committee says, "Operation of the street car line is business." It would, indeed, be difficult to make eight words say more.

In this connection, it is well to note some interesting parallels between the Seattle and Portland situation as illustrated by this report, on the one hand, and the Carey & Harlan plan for Portland, on the other hand. In the first place, the Seattle report bears a very close relation to the Carey & Harlan plan in its treatment of the paving problem. The language and arguments in favor of transferring the burden of paving between the tracks to some support other than the department in the one instance, and the company in the other, are nearly identical.

For Portland, Carey & Harlan advocated that the city acquire the tracks and pavement between the tracks, and assume responsibility for construction and maintenance. In Seattle, the department has been attempting to take care of such items of expense out of railway revenues, but now proposes to transfer this burden to the general taxpayers or assessment districts. Seattle, however, would go farther and tax automobiles, diverting some of such tax money to the purpose of building and maintaining streets.

The utter failure of the Seattle Railway Department to amortize its investments out of earnings, and at the same time maintain its physical property is no surprise to those familiar with transportation problems. Whether the plan for Portland, calling for the amortization of the company's investment in tracks and streets, out of earnings, can be successfully accomplished is problematical. In some respects, Portland is at the crossroads. It should proceed cautiously.

Undermining an Essential Service

DISREGARDING the costly lessons of past experience, municipal authorities in numerous American cities are permitting a new kind of transportation rate war to develop. Cut-rate taxicab service by irresponsible individuals has been allowed to grow to a point where it threatens to undermine organized transportation service. While most of these cheap taxi operations are on an extremely unstable financial basis, it appears that the operators may be able to make both ends meet so long as they are not compelled to assume any definite service obligations. In many localities they have cut deeply into the revenues of mass transportation agencies.

On the surface, the harmful effects of cut-rate taxicab operation are not clearly visible. To the man in the street it appears that the taxicab operators are able to make a living and the users of their service benefit by its cheapness. Hence, he is content to let the situation stand as it is.

That view, however, takes no account of other factors of vital importance. The effect of cut-rate operation extends far beyond the taxicab operator himself and his patrons. It is depriving other transportation agencies of revenue essential to their successful operation. It is undermining a service which it cannot replace. Under no imaginable circumstances could the taxicab become a satisfactory substitute for the street car or bus. For several people going to the same destination, it might be possible to travel cheaper by cut-rate taxicab than to travel by street car or bus, but for individuals traveling alone the cost would be excessive. Moreover, the streets of our cities are already too congested to accommodate the vast number of vehicles that would be required to perform mass transportation service by taxicab.

In view of these facts, it is clearly in the public interest to protect the mass transportation agencies from this destructive competition. This can be done only by adequate regulation of taxicab operations. The number of cabs should be limited to the legitimate demands of public convenience and necessity. Experience in the six states where this has been done on a state-wide basis, and in about a dozen cities in other states where it has been done by local ordinance, shows the value of such limitation. If reasonable service standards are required, taxicab fares will automatically be placed on a fair competitive basis. To the business they can secure on that basis the taxis are honestly entitled. But to permit irresponsible taxicab operators to continue to take business from established agencies required by law to maintain high service standards can result only in disaster to the users of public transportation.

Progressive Management Requires Research Support

DEFINITE need exists for fact-finding research in the electric railway field. That it has been employed to a considerable degree by many companies is evidenced by the constant development and improvement in practically all phases of railway operation during an era in which gross revenues have been steadily declining. The introduction of such competitive factors as the automobile, the bus and the low-rate taxicab forced the railways to search their own operations for economies, for the elimination of waste and, in general, for practices that would result in a lower operating ratio. In this they have been remarkably successful as shown by the steady increase in net revenue of the industry and improvement of physical plant, which occurred up to the beginning of the present business depression.

Necessity, however, has not been wholly responsible for research or experimentation in the past. A certain "research-mindedness" is natural to an industry using a large amount of complicated electrical and mechanical equipment. Much has been done along these lines but the railways have not until recently applied research to the problems of management. In that field the value of research is even greater. From the broadest operating policy to the smallest detail, management is responsible. Unless it can see clearly and without prejudice the facts supporting its practices, the facts that remain sound, those that have become obsolete, and the new facts which may have entered into the situation, successful results are impossible.

Many railways are making energetic efforts to operate on a factual basis and are employing research to keep pace with changing conditions. Not many, however, have placed research in a position to be really effective. The research engineer must be free from the stress of operating responsibility; he must be in a position to co-ordinate effectively the problems of management and the efforts of his department workers in solving them, and he must have the authority to follow up the results of research and demand the utilization of its findings. If management is not willing to give research this major position in its organization, operation becomes a habit and practices change only under the forces of emergency or on the unsupported conclusions of personal opinion.

RESEARCH DEPARTMENT

Aids Railway Operations

Pittsburgh Railways Endeavors To Conduct Its Operations on a Basis of Facts Disclosed by Systematic Investigation. Detached Research Group Is One of Major Departments. It Is Composed Principally of Individuals Transferred from Other Departments

MANAGEMENT research, or an orderly application of simple but sound methods in the effort to solve everyday problems, is a major factor in the operations of the Pittsburgh Railways. This company has long been among the leaders in experimental research—principally in car design. Such habit of thought naturally led to a recognition of the fact that approaches to all problems are fundamentally similar, though they may vary infinitely in detail, and that the same procedure which had proved so successful in dealing with technical problems could be applied to the difficulties confronting management. In recent years street railway managements have found themselves faced with constantly changing conditions and in need of every instrument that could be found or devised to help identify previously determined facts which remained pertinent, point out those which had become obsolete, and discover the entrance of new facts. Consequently, a research department was established for the purpose of bringing to the aid of management those practices and methods that had been accepted as matters of course in technical and experimental research for many years.

Fundamentally, the research department is separate and detached from all other departments in the organization. It is non-competitive in the strictest sense and is furnished as an instrument by the management for the use of officials and employees. The measure of the utility and value of the department is in the consumption or use of its findings or research releases.

As the department exists now, it is composed chiefly of individuals transferred from other departments. When first organized, it consisted of a research manager, a research engineer, a combined stenographer and routine office worker, and a small statistical group which had been doing statistical work for the operating management.

For about two and one-half years the department continued to function approximately as organized. Then it was re-organized, consolidated with the general operating offices and placed under the supervision of the assistant to the vice-president, whose title was changed to "research manager."

The work is divided into three sections: that done by an analyst or economist; an engineering division, in charge of a research engineer; the general operating office in charge of an office manager.

The work referred to the analyst consists of studies and researches where the broader principles of economics are involved. The economic factors involved in fare structure, pensions, insurance, etc., are typical.

The engineering division, as indicated by its name, is engaged in practically applied research engineering. It is in charge of a civil engineer, with the title of "research engineer," who was transferred from the roadway department. This division has been manned completely by bringing in employees from other departments rather than importing highly trained specialists from other fields. The type of work ranges from studies designed to influence important decisions in policy to clarification of troublesome details.

In addition to a group of engineers, the research engineer has a supervision over a statistical section, a recurrent work section, and a budget section.

The statistical section supplies certain statistics required by the operating management, and those needed in the development of research studies. The recurrent work section originally was a group of clerks set aside to do work of such a definitely recurrent nature that the jobs could be scheduled with a fairly reasonable degree of exactness. It was found that, by an extremely simple method consisting of element identification and requirement for reauthorization at reasonable intervals, continuance of any recurrent clerical work, after it had ceased to be profitable, could be avoided. The benefits secured have been so evident that an engineer has been placed temporarily in charge of analysis and studies incident to installation of similar methods in operating departments. The budget section is engaged in formulation of annual operating and improvement budgets and revisions thereof. This section also maintains comparisons of actual performance with budget estimates and conducts such analyses as are deemed necessary to bring out pertinent facts.

The general office division, in charge of an office manager, which performs office service for all operating general offices was combined with the research department for reasons of economy and effectiveness. The department, when first organized, suffered from lack of stenographic assistance. The consolidation has not only corrected this situation by making available a larger and more flexible group, but the orderly method which permeates activities has been beneficial to office operation. There is now one general file which also serves to pre-



Systematic examination of underlying facts is essential in determining the soundness of conclusions

serve research material where formerly there were several departmental files.

The responsibility of the research manager consists of achieving co-ordination between the department and other officials of the company as well as among divisions and individuals of the department. He is responsible for the initiation of research projects, their placement in priority, their production, their presentation, and to a degree their consumption. He is chairman of an advisory council which is composed of the heads of the commercial department, department of maintenance and construction, department of traffic and transportation, and the Pittsburgh Motor Coach Company. Placed in this manner on a level with all other department heads who report to the operating vice-president, he has an opportunity to co-ordinate the activities of the research department with all operating activities. The research engineer is chairman of an operating committee composed of operating executives who report to some member of the advisory council. This arrangement further extends the opportunity for co-ordination.

Neither the research manager nor the research engineer has operating authority or operating responsibility. Both are charged, however, with the responsibility to exhaust their efforts to see that all pertinent facts are considered in the discussions over which they preside. Such an attitude of "research-mindedness" on the part of the management of the Pittsburgh Railways has been the dominating factor in the successful operation of the research department.

The Cost of Research Work

Management research, as the Pittsburgh Railways is endeavoring to use it, is not some new experimental thing intact in itself, superimposed upon the former type of operation. It is more nearly a regrouping of service units with certain additions, all of which are operating in a detached research atmosphere. This arrangement was induced by an attitude which admits the existence of rapid change and the necessity of making use of whatever scientific principles experimental research has developed in any field. The net result appears to be simply a concentration of effort and an improved production of usable material for the support of management in dealing with everyday problems. The description of the organization indicates that numerous types of work and service other than the development of purely research studies are performed. It is obvious, therefore, that purely research studies share the burden of overhead costs with other types of service common to all companies.

The cost of actual research work is almost as flexible as the cost of piece work, as its expansion or contraction is governed by work units.

Following is a table showing, in percentages of payroll, how the energies of the department are divided:

Division of Department Energies

	Per Cent
Reports and studies	39
Statistics in support of reports and studies	6
Recurrent statistical and clerical work	13
Budget work	10
Welfare work—investigating cases of unfortunate employees and arranging loans	3
General office service for the vice-president, general superintendent of transportation and traffic, general superintendent of maintenance and construction, Pittsburgh Motor Coach Company, research department, and file service for commercial department	29

Not all research work of the Pittsburgh Railways is confined to the research department. Technical and experimental work has been continued in departments where it is obviously practical. In such cases individuals have been partly or completely freed from operating responsibilities, and an effort has been made to provide working conditions where detached thought is possible.

A further insight into the activities and scope of the Pittsburgh Railways research department is made possible by examples of specific studies which have either been released or are now in progress:

- Car design
- Fare structures
- Motor coach routes
- Wage agreements
- Trolley bus
- Operating estimates
- Incline operation
- Retirement plan
- Insurance
- Test of air in Mount Washington Tunnel
- Time-keeping methods
- Studies of revenue trends
- Motor coach tests and experiments
- Track relocations
- Safety islands
- Statistical studies

While recurrent statistical work can scarcely be termed "research," jobs such as are listed below are done. This is purely clerical work which can be done whenever it is deemed most expedient. It is carefully controlled by identified work units and is made to fit immediate needs of the management. The units recur with sufficient regularity to permit scheduling. The following are typical:

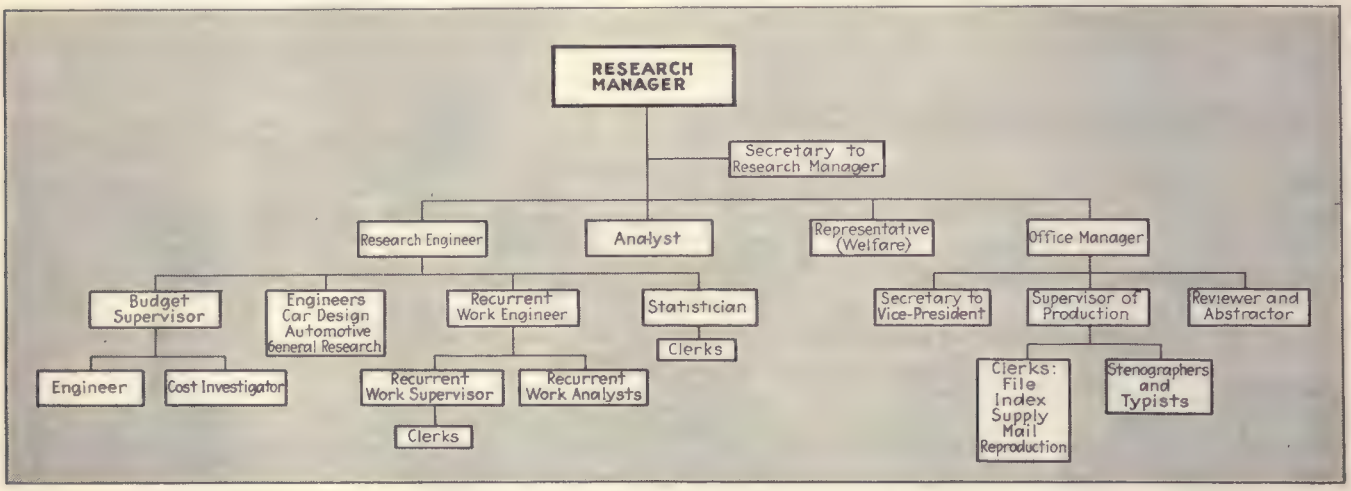
Detailed analysis of operating expenditures.
Analysis of storeroom materials and supplies, withdrawals.
Analysis of complaints and commendations.
Analysis of accidents.
Analysis of car turns.
Analysis of trainmen's wages.
Analysis of time allowed trainmen in excess of scheduled time.
Analysis of sick absenteeism.
Preparation of daily report of car-miles operated—by route.

Sound Production Methods Essential

The opportunities for improving production both as to timeliness and economy through elimination of waste became more and more apparent as the experience of the job or jobs under active production; the second, those jobs waiting for material; the third, four or five jobs chosen with care to move into production next; and the fourth, jobs which are waiting in a selective line for later movement into production. Since the daily priority change involves no clerical work but simply movement from one compartment to another, the time required for maintaining the method is next to nothing.

A project placed in priority is considered as a product to be manufactured and consumed. At no time is there a question in the mind of any employee, his immediate supervisor, or the department manager as to which jobs constitute the employee's immediate, entire responsibility. Establishment of priority is the job of the department head, and whenever it is tossed to one not actually responsible for it, waste is bound to result.

The handling of recurrent work is as carefully organized as that coming under the head of non-routine work. Each item of routine work which may recur with regularity either daily, weekly, or monthly, must carry an



Co-ordination of the research and general office personnel of the Pittsburgh Railways has produced an efficient and economical organization

the department increased. The wastefulness of unsatisfactory work, either because of misunderstanding of objective or other reasons, stimulated serious effort to secure a better understanding of the elements which help or hinder desk-workers. The result has been the creation of methods designed to make the most of helpful factors and to avoid the destructive ones. A research worker cannot achieve reasonably satisfactory production unless his working conditions include at least the following:

1. A common understanding in fact with his supervisor as to the scope of a job, the objective, purpose, and the time factor.

2. The priority of the unit of work given him should be definite. Conflicting demands, where definite priority of units is ignored, destroy the possibility of good jobs. Such is not thought of where the work units are tangible, as in a shop.

When a job comes to the department, it is set up as an identified work unit, entered in a ledger and numbered consecutively. The job is then set up on a small sheet of paper which fits a pocket-sized, loose-leaf note book. The research manager has a book for each worker who is assigned non-routine jobs. The worker and his immediate supervisor have duplicates. The books are divided into compartments, the need for which has been indicated by experience. The first compartment holds authority. This authority is repeated at intervals to obviate the possibility of work being done after its value has passed. The accumulation of useless clerical work is thereby prevented and valuable work is not kept waiting because of unprofitable use of a clerk's time.

Effective Follow-Up Essentials

The research department is non-competitive and makes no attempt to show specific economies and other achievements to which it has contributed. The department's chief aim is to perform a useful service which can only be accomplished by a co-operative effort on the part of recipients of releases to profit by the work done. Consumption does not mean the blind acceptance of a research department release. It does not necessarily mean acceptance at all. But it is the policy of the company that the releases cannot be ignored. If an operator can take issue and support his position, he is expected to do so, and such action is considered to be consumption. If evidence of such use is not apparent in a reasonable time, inquiries are made and follow-up procedure instituted. If necessary, the research manager is expected to formally request consideration of the release, with copies of such request going to other members of the advisory council and to the vice-president. An authorized follow-up procedure is a factor of prime importance in the

effectiveness of a research department, and is a definite recognition on the part of management that, if it is to endeavor to base its policies and operation on a factual basis, the results of research effort are all pertinent to the subject involved. The consumer is not only expected to differ, but it is considered his duty to do so if he can justify his position. Furthermore, the research department is expected to welcome conflicting views, and to help secure material to support such opposition—all as a fact-finding effort. But any prospective consumer who fails to do all he can to make the most of the work done by the research department and to exhaust the releases for whatever helpful material they may contain is acting contrary to company policy.

The research department in Pittsburgh has definitely dispelled the general idea that only highly trained technical men are suitable for research work. In highly technical matters, the specialist is required and used, but he is treated as a specialist and is retained for the particular project requiring his services. For the everyday research worker the department depends upon the man of practical intelligence—one who is inclined to develop an accuracy in observation, to draw reasonably sound inferences, and to use good judgment. In addition to this, it is imperative that he develop a persistent concentration which drives him doggedly into his problem. Engineering training is regarded as a distinct asset, but not an assurance of research performance of a high grade. Some individuals who are not engineers are delivering excellent work. The experience of the department points to the value of an attitude which accepts constant change as an inevitable fact and fears both undue emphasis upon particularities and conclusions which may once have been sound but which have become obsolete.

Knoxville Trolley Buses Increase Patronage

FAVORABLE expressions of opinion indicate that the trolley buses placed in service by the Knoxville Power & Light Company on April 28 are being well received by the public. More tangible proof, however, is found in the 15 per cent increase in riding which has occurred on the Lyons View line. Apparently, the patrons are being attracted by the speed, quietness, convenience and flexibility of the new vehicles.

Service on this line previously was given by electric cars which operated through paved streets to the city limits, and from there to the end of the line on open track at the side of the highway. About a year and a half ago the company was faced with the problem of rehabilitating and extending the car line. Subsequently, it was decided by the City Council of Knoxville to undertake street widening and repaving. Negotiations with the company resulted in a decision to remove the track and install trolley buses. Accordingly, four trolley buses, with a seating capacity of 43 passengers each, were ordered from the Cincinnati Car Corporation. Actual service was begun on April 28, 1930.

At the present time, two of the vehicles are used during base hours on a 30-minute headway. During rush periods, all four are used and the headway is reduced to fifteen minutes. Daily vehicle-miles total approximately 527. Because of the higher acceleration and breaking rate, as well as higher free running speeds, the vehicles are able to maintain faster schedules on the line. The former time of one hour and fifteen minutes for the round trip has been reduced to one hour. The average scheduled speed for the run is 10.54 m.p.h.

The route, as shown on the accompanying map, extends from the heart of Knoxville's business district to a point to the southwest, a distance of 5.27 miles. In the business district the vehicles enter on Clinch Street and loop around through Walnut, Union and Gay Streets. The streets are extremely narrow and congested there, but the trolley buses operate satisfactorily, even on the

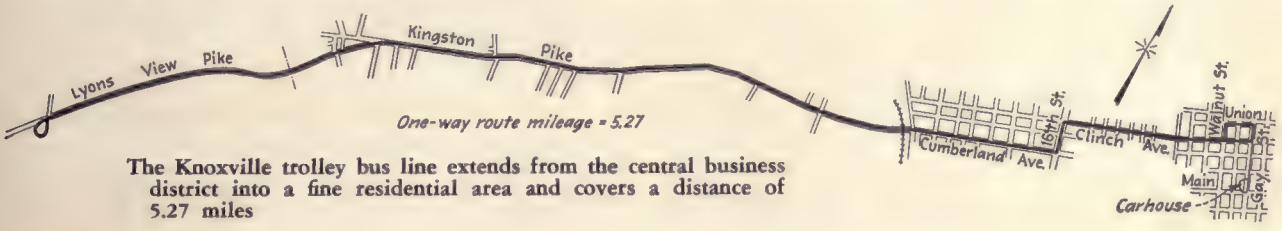


Trolley buses in the business district of Knoxville

sections of the route which are duplicated by street car lines. Downtown the trolley buses use the raised concrete loading zones provided for street car patrons. After leaving the business district the route enters one of the finest residential districts in the city.

In the business district the trolley buses use the same positive contact wire as do the street cars. At intersections where street cars operate straight through and also turn, a special mechanical frog, developed by the Ohio Brass Company, with tongue actuated by a tripping device on the negative wire, is used. As the latter is only used by the bus, the passage of a trolley wheel can be utilized to set the frog tongue in the positive wire. It other instances turnouts are provided with electrically operated frogs.

The vehicles are stored and maintained at the Main Street carhouse which is located 0.14 mile from the regular route at Gay and Clinch Streets. To allow for satisfactory inspection and repair, guards were placed along the sides of one of the car pits and double trolley installed over one track in the repair section.



The Knoxville trolley bus line extends from the central business district into a fine residential area and covers a distance of 5.27 miles

Extensive Rehabilitation



Forty new cars of this type were recently placed in service by the Des Moines Railway

Purchase of 50 new cars, complete transformation from two-man to one-man operation, remodeling of all rolling stock, betterment of service, improvement in power system and effecting of major economies among steps taken by new management

By LAURENCE WINGERTER
Publicity Director Des Moines Railway

WITHIN a period of a little more than a year the Des Moines Railway has carried out an improvement program which has included almost every part of its physical plant, and which has affected every phase of its operation. Definite results already realized are lower operating expenses and a better state of public relations. With the return of business conditions to normal it is anticipated that the new equipment, higher speeds and general improvements in service will cause an increase in patronage. With more business and lower expenses, the company should have a satisfactory showing, reflected in the net.

Announcement of the plans followed the purchase of the Des Moines City Railway at the receiver's sale on June 22, 1929, by Walter J. Cummings and Charles G. Adsit. The new company, with the name changed to the Des Moines Railway, was incorporated and took formal possession on July 15. Officers of the company now are Mr. Cummings, chairman of the board, Mr. Adsit, president, and C. W. Gifford, general manager. Mr. Gifford has had direct charge of the rehabilitation.

Of the major moves made by the new management, two are of outstanding importance—the purchase of 50 new cars and the complete change-over from two-man to one-man operation. Previous to the change-over, it was necessary to remodel 101 of the company's cars. In this work, standardized motors and other parts were adopted, new fare registers were installed, many safety devices were added, and other modern equipment installed. Following the purchase of the new cars, 40 street cars of an obsolete type were retired. Among the other steps taken were the speeding up of schedules, merchandising the service, effecting economies and improving the power system.

Ten of the 50 new cars were ordered shortly after the reorganization of the company. They were of the double-truck, single-end type, arranged for one-man operation. Individual leather-upholstered seats were provided and special attention given to interior decorations and lighting.

During the current year, 40 additional cars of modern design, built by the Cummings Car & Coach Company, were delivered. These cars have a well-balanced design, attained by wide-vision windows, a narrow letterboard and a low arched roof. A detailed description of the cars appeared in the July, 1930, issue of ELECTRIC RAILWAY JOURNAL.

SCHEDULED SPEED INCREASED

Coincident with the installation of the new cars and the adoption of one-man operation, the railway increased the number of cars in peak service from 108 to 140, or

Places Des Moines in Favorable Position



New standard uniform and cap of special blue-gray fabric which replaced the old standard blue serge suit and stiff cap used for many years

30 per cent, shortened the headways, and speeded up its schedules. All one-man schedules, both base and peak, are as fast as, or faster than, the two-man schedules of the same line. Weighted averages show an increase from 11.11 to 11.61 m.p.h. for base hours, and an increase from 10.84 to 10.97 m.p.h. for peak periods. Likewise, all headways were shortened or remained the same. Reductions on certain lines were as great as four minutes in base operation, five minutes in the afternoon and two minutes in the peak.

Express cars, operated by one man, have been inaugurated on several lines, and have proved popular with the riding public. In the near future the company plans to extend express service to every route where existing track facilities permit.

For busy lines, where cars are only two and three minutes apart during rush hours, company engineers have developed a novel plan, to be tried soon, known as "relay express service." In starting the system an extra car will be placed in service near the outer end of a line and run as express, making no stops to pick up passengers, until it overtakes the car immediately ahead. Then, upon exchanging pre-arranged signals, the first car will become an express and the second car a local.

Cars are being equipped with field tappers to increase the speed, and quick application valves have been installed to reduce the time of stopping. Electric track switches and new automatic signals have been installed as additional time-savers, and two snow sweepers have been purchased to speed the clearing of lines in winter.

Efforts to merchandise the service have included the adoption of new trainmen uniforms, instruction in selling of rides, the creation of a company publicity department, and the adoption of a new transfer system. All publicity now originates in the company. By adopting an open attitude a friendly relationship has been built up with the press. News stories regarding company affairs are sent to all daily and community newspapers, giving correct accounts to the readers.

In all newspaper advertising two points are stressed—economy and service. And in every case the psychology is followed that "Almost everybody's riding with us. Why not you?" A typical economy advertisement, one of eight in a thrift series, is illustrated. Several other media are used for advertising—inside car cards, front and rear dash posters, the latter proving effective for directing messages to motorists, billboards, radio, direct mail, city maps, pamphlets and a car which is given new messages for the public every 3 months. The theaters run trailers in exchange for advertising of current movies on the cars. Another co-operative plan is the giving of a weekly pass with information about the service to new families in the city, along with gifts from various sponsors, distributed by a "hostess" in her "welcome wagon." A follow-up letter is mailed later to ask if the service has been satisfactory.

"Street Cars Paid for My New Clothes". . . .



"I'VE had the most fun buying clothes this week. George told me to select a complete fall wardrobe. He's earned a lot of extra money riding street cars.

"George says that by taking the street car down to the office instead of driving our auto, he saves twenty-five dollars a month. Imagine it! And yet we haven't sold our car. We keep it for driving out to club and for Sundays.

"Twenty-five dollars a month seems like a big difference between street cars and autos, but George says that it costs ten cents a mile to drive our car. That's almost a dollar a day to drive to work, not to mention five dollars a month for parking. He's a confirmed trolley rider now and we're both ahead at the end of the month."

Many Des Moines families now have two cars—the family auto and the street car. The trolley has become the accepted mode of travel to and from the congested loop district.

DES MOINES RAILWAY COMPANY

Example of newspaper advertising, stressing the thrift of riding cars

Power Distribution System Improved

Three projects were included in the program for bettering the power supply—the complete rehabilitation of the power plant, the stringing of new feeder cables, and the construction of a new substation. Improvements in the railway's 14,000-kw. power plant included the installation of vertical baffles and Dietrich arches in all boilers, and the purchase of additional gages, pumps and auxiliary devices for regulating generation. Better firing, more efficient boiler conditions and increased economy have resulted. A total of 5,000 ft. of 500,000 circ.mil copper feeder cable was strung on the Sevastapol line, increasing trolley voltage and lowering operating cost. With the new feeders, car speeds were increased

and peak headways were reduced from fifteen to thirteen minutes without the use of additional cars. The new substation was constructed at the West 24th Street carhouse. Special transformer and rotary rooms were constructed, and a 1,000-kw. synchronous converter was placed in service. Following this change 6,000 ft. of additional feeder cable was strung and power conditions were improved on three lines.

A Year of Progress

Since July, 1929—fifty new street cars, more service, faster schedules, better power, new snow-sweepers, new motor coach, more electric heat, new registers, more safety devices, new transfers, new signals, new electric switches.

Inside car poster, depicting the progress made by the company during the year

Major economies, aside from those effected by the use of new cars and the adoption of one-man operation, have been brought about by the consolidation of departments, elimination of the all-day line trouble crew, suspension of the bridge crew, replacement of advertising agency with a company publicity department, elimination of supervisors' automobiles, and installation of storage gasoline tanks for bus fuel. In the consolidation, the purchasing and stores departments, the power plant and car shop mechanical departments, the auto and bus repair shops, and the power plant and substation departments, were combined, respectively. It is significant that operating costs have been reduced from 28 cents, including depreciation, to 23 cents per car-mile.

Opposition to One-Man Operation

Complete transformation of service and equipment from 100 per cent two-man operation to entire one-man operation was the task required of, and accomplished by, the Des Moines Railway in the short period of six months. One hundred and one cars were remodeled between Feb. 15 and June 1, 1930, the first actual one-man service was started on July 4, and 100 per cent one-man operation was completed on Aug. 18.

Serious political opposition and objection from the trade unions presented a real problem for the company. During a political campaign in March, 1930, pledges opposing one-man operation were secured from all candidates for election to the City Council. Petitions opposing the substitution also came to light in various portions of the city and were presented to the Council, along with a suggested draft of an ordinance designed to prohibit one-man cars. On April 24 the first reading of the anti-one-man car ordinance was passed by the Council.

Meanwhile, the railway launched a campaign of education in which the merits of one-man operation were explained in talks to luncheon clubs and community organizations, and by car card and newspaper advertising. This was supplemented with a successful drive to secure a counter petition through the efforts of foremen and office employees. Presentation of this counter-petition and resolutions of various clubs and civic groups to the City Council changed the attitude of this body.

During this period, the entire rolling stock of the company, with the exception of 40 obsolete cars doomed for the scrap heap, was being overhauled for immediate one-man operation. As the cars were completed they were placed in regular service with two men on each car. The conductor, however, was stationed on the front platform and passengers used the treadle exits at the center or the rear. This procedure acquainted the public with the features of safety cars, demonstrated that a second man was not necessary and enabled the company to instruct a majority of its trainmen in the use of the new equipment. On June 30, the City Council decided to postpone any action on the proposed anti-one-man ordinance for a period of at least six months. This action provided the company with the desired opportunity to demonstrate the efficacy of one-man service, and, accordingly, two lines were converted on July 4. Other lines were changed as rapidly as possible, and by Aug. 18, one-man operation had been extended to the entire fifteen lines.

Problems in Remodeling Equipment

Many interesting problems attended the conversion of the 101 cars, of which there were five distinct types. Forty cars had double entrance doors in the center and single exit doors in front. Fifteen cars had an extremely small drop platform on the front and a large drop platform on the rear. Twenty-six cars had drop platforms of equal length front and rear, while the remaining twenty, of two different types, had platforms of modern ramp design. All cars were single end, double truck.

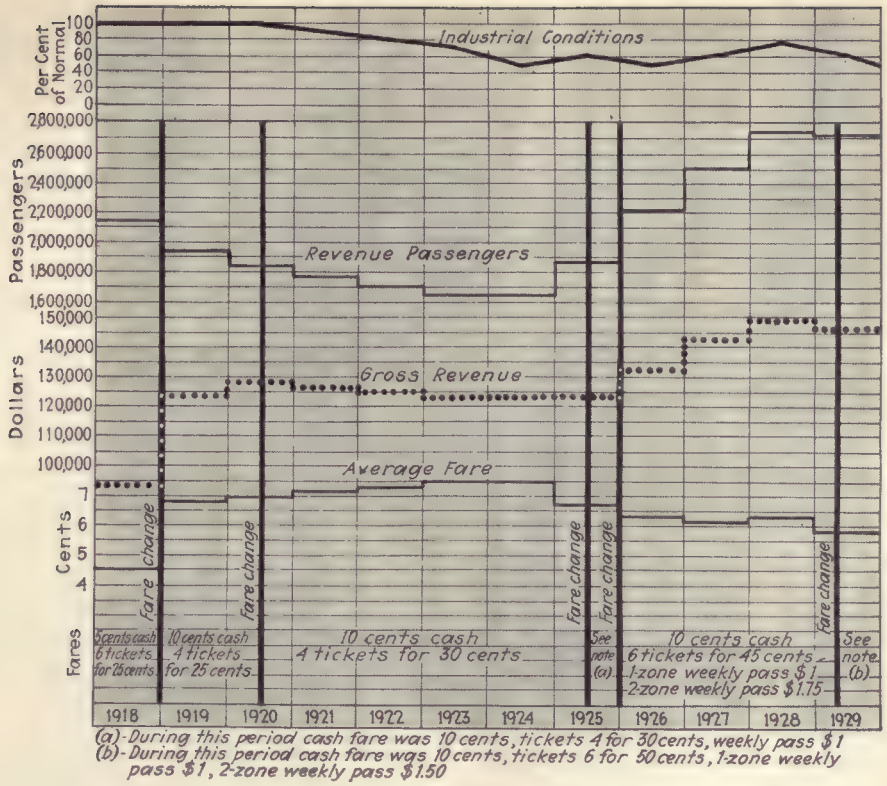
The rehabilitation was begun simultaneously at two locations. At the company's main shop, extra carpenters, machinists, painters and electricians were hired. At a second location, where shop facilities were provided, a group of men from the Cummings Car & Coach Company assisted in the work.

It was decided to install every practical modern safety device and to standardize the equipment and controls to the fullest extent. It is worthy of note that all active cars of the company now use the same type of motor, thereby reducing stores and maintenance expense.

Included in the specifications were treadle-operated exit doors, automatic door-reversing mechanisms, ample rubber at sides and bottoms of doors, anti-pinch devices between door leaves, quick release and quick application valves, emergency valves, hand and foot dead-man control, signal lights, inside and outside mirrors and rear-end reverse control. The fare registration system was changed with the advent of one-man service, and new Ohmer registers were installed on all remodeled cars.

Controllers were moved as far to the left as possible and air valves were located approximately in the center, giving ample room for boarding passengers. Copper tubing was used extensively for piping. For convenience in maintaining air equipment, a single compact unit, comprising the quick release valve, emergency valve, double check valve, magnet valve and air contactor, was located conveniently at the front.

From a transportation standpoint, the change-over to complete one-man operation in six weeks presented a huge problem. Previous to the first substitution on July 4, all men had been instructed in the operation of the new equipment. Special supervisors remained with all trainmen until they were deemed competent to operate the cars alone. By beginning operation with comparatively light Sunday riding, operators were enabled to become acquainted with their duties before the weekday rush.



During a period when industrial conditions were below normal gross revenue and number of passengers carried have increased as the average fare has decreased

HIGHER REVENUE

With Lower Fares

How a small electric railway has popularized its service by readjusting its rates to meet changed conditions

NOTEWORTHY increases in gross revenue and in the number of passengers carried have been effected by readjusting rates of fare to meet changed conditions in the territory served by one small electric railway. The present average fare is 15 per cent below that of 1919, while the gross revenue is nearly 20 per cent higher. The number of passengers carried last year was approximately 30 per cent greater than in 1919. In the opinion of the management, the success which it has had in building up traffic has been due primarily to the adoption of rates of fare which encourage the use of its service.

For many years prior to 1919 this railway operated on a 5-cent cash fare with six tickets for 25 cents. Under these rates about 75 per cent of the passengers used tickets. War-time conditions necessitated an increase at the beginning of that year to 10 cents cash with four tickets for 25 cents. Thus for the first time a marked differential was created between the fares paid by the casual rider and the regular rider. This differential increased the use of tickets to 90 per cent. The principle of lower fares for regular riders established at that time became the basis of the "merchandising rates" subsequently adopted.

Operating costs continued to rise, however, and in 1920 the ticket rate was increased to four for 30 cents, while the cash fare continued unchanged. This reduced the differential somewhat, but it remained large enough to attract about the same per cent of patrons.

During the next several years the management gave close attention to the subject of fares. It was felt that the users of the service represented three distinct classes: (1) casual riders, (2) intermittent riders, and (3) regular daily riders. Since the riding habit of each class

Passengers Carried

Year	Cash Fares	Tickets	Passes	Tickets and Passes	Total
1918	537,780	1,603,888	.....	.....	2,141,668
1919	162,248	1,784,532	.....	.....	1,946,780
1920	161,653	1,678,600	.....	.....	1,840,253
1923	232,065	1,416,090	.....	.....	1,648,155
1924	222,643	1,433,552	.....	.....	1,656,195
1925	216,420	1,287,744	377,047	1,664,791	1,881,311
1926	295,851	1,078,301	853,515	1,931,816	2,227,667
1927	324,781	1,065,182	1,116,865	2,182,047	2,506,828
1928	346,847	1,077,665	1,306,147	2,383,813	2,730,660
1929	326,317	964,902	1,428,871	2,393,773	2,720,092

Sources of Revenue—Per Cent

	1923	1924	1925	1926	1927	1928	1929
Cash	18.7	17.8	17.4	22 3	22.8	23.0	22.2
Tickets	81.3	82.2	73.0	56 9	51.4	49.0	46.6
Passes	....	....	9.6	20 8	25.8	28.0	31.2
Total	100 0	100.0	100.0	100.0	100.0	100.0	100.0

Classification of Passengers—Per Cent

	1923	1924	1925	1926	1927	1928	1929
Cash	14.0	13.3	11.5	13.3	13.0	12.7	12.0
Tickets	86.0	86.7	68.4	48.4	42.6	39.5	35.5
Passes	....	....	20.1	38.3	44.4	47.8	52.5
Total	100.0	100.0	100.0	100.0	100.0	100 0	100 0

was different from that of the other classes, it was thought that each should have a rate of fare suited to its own needs. Meanwhile, automobile competition was having a serious effect upon the railway's traffic. The problem was submitted to the Public Service Commission for its consideration, with the result that authority was granted to charge any desired rate of fare up to and including 10 cents in any one zone.

Three routes are operated by this railway over a total of 12.5 miles of track. Of this trackage approximately a quarter of a mile is common to all three lines, one of which is 2 miles long, a second is 3 miles, and the third, 8 miles. Each of the short lines has a single zone, while the long line is divided into two zones. Four municipalities, with a total population of 22,000, are served.

The first step in adjusting rates to meet the needs of different classes of riders was the adoption of the weekly pass in 1925. This pass, which was valid only on the short lines, was sold for $1. Figures for the year 1925, during which the new rate was in effect for about six months, show that a downward trend in revenue was checked so effectively that the total for the year was about the same as for 1924, while the number of passengers carried increased to a marked extent.

Use of the weekly pass on the short lines aroused a strong desire on the part of the patrons of the two-zone line to have the use of the weekly pass extended to their service. Early in 1926 the management consented to this plan, and the regular $1 weekly pass was made applicable to the first zone of the long line. A universal weekly pass covering all zones on all lines was established at a price of $1.75. At the same time the ticket rate was changed from four for 30 cents to six for 45 cents, it being thought that the necessity to buy tickets in larger quantities would stimulate the sale of its passes. The effect of these changes was to increase both the number of passengers carried and the gross revenue. At the same time the average fare was reduced.

During the latter part of 1929 industrial conditions became seriously depressed in the territory served by this railway and riding began to be curtailed. Another change was then made in the fare schedule, the ticket rate being increased to six for 50 cents and the price of the universal pass reduced from $1.75 to $1.50. While this did not entirely stop the decrease in riding, it was successful in checking it to a considerable extent, as shown by the figures shown in the table below.

During the first seven months of the present year the revenue decreased about 7½ per cent. Cash and ticket revenue decreased greatly, while pass revenue increased moderately. In the opinion of the management this result furnishes good indication of the value of the change in rates.

Advantages of the merchandising fare scale used by this railway are believed to be that it has popularized the company and its service, has brought back to the street cars a substantial amount of traffic which formerly used private automobiles, and has secured the maximum available revenue. Investigation has disclosed that approximately 65 per cent of the pass rides are taken during off-peak hours and only 35 per cent in the rush hours.

Effect of Fare Changes Made in 1929

	7½ Cent Ticket Revenue	Loss	Pass Revenue	Gain	Total Loss
January to June 30 Before Change					
1928	$35,296		$21,302		
1929	33,382	$1,914	21,764	$462	$1,454
July to December 31 After Change					
1928	$34,371		$20,949		
1929	30,924	$3,437	23,934	$2,985	$452

Note—Change in fare scale was from six tickets for 45 cents to six tickets for 50 cents, and three-zone pass from $1.75 to $1.50.

Several methods have been adopted to popularize the pass. During the Christmas holiday week, when many industries are shut down and pass sales would ordinarily decrease sharply, the management adopted the plan of giving away a leather card case in which the pass could be carried. Another method adopted has been to give free passes for the following week to five out of every 100 buyers. Individual pass holders who receive them are selected by drawing numbers out of a hat. Winning numbers and names are published in local newspapers.

Along with its merchandising fare scale, the railway has adopted numerous other means of popularizing its service. It has adopted a new color scheme for its cars, has made innovations in the way of leather upholstery, rubber tile flooring, aluminum fittings, etc. It has also done effective publicity work in a bulletin which it distributes on the cars and in the newspapers of the territory. In the opinion of the management, however, the most important single factor in building up the traffic has been the adoption of the merchandising fare scale.

Sources of Revenue

Year	Cash Fares	Tickets	Passes	Tickets and Passes	Tota	Rates of Fare: Cash	Tickets	Passes
1918	$26,889	$65,385	....	.....	$92,274	5 cents	Six for 25 cents	
1919	16,224	108,278	....	.....	124,502	10 cents	Four for 25 cents (In force first of year)	
1920	16,165	111,620	....	.....	127,785	10 cents	Four for 30 cents (In force six months only)	
1923	23,206	100,896	....	.....	124,103	10 cents	Four for 30 cents	
1924	22,264	102,291	....	.....	124,555	10 cents	Four for 30 cents	
1925	21,642	90,684	$11,956	$102,640	124,282	10 cents	Four for 30 cents	$1.00
1926	29,585	75,475	27,818	103,293	132,378	10 cents	Six for 45 cents	$1.00 and $1.75
1927	32,478	73,402	36,704	110,106	142,584	10 cents	Six for 45 cents	1.00 and 1.75
1928	34,685	73,878	42,251	116,130	150,814	10 cents	Six for 45 cents	1.00 and 1.75
1929	32,632	68,571	45,698	114,269	146,901	10 cents	Six for 45 cents	1.00 and 1.50

Philadelphia Sample Car

Uses Single-Reduction Drive With High-Speed Motors and Magnetic Brakes

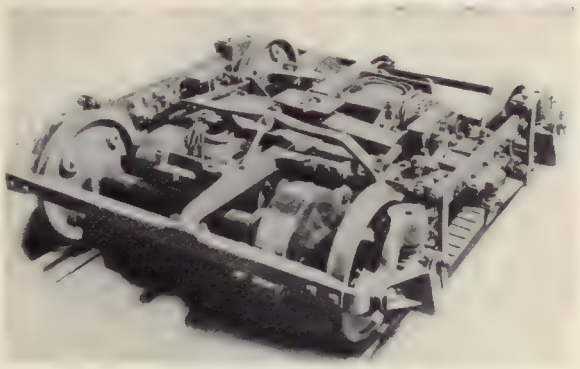
DESIGN of a street car of a new type was undertaken by engineers of the Philadelphia Rapid Transit Company with the purpose of obtaining faster acceleration and braking, placing of more of the operating equipment under a control board and arrangement for efficient operation by one man. In its present form the design of trucks and control equipment has been worked out and the parts have been mounted on one of the existing cars of the company.

The appearance of the front platform is shown in an accompanying illustration. The operator sits on a stool which is secured to a platform raised about 10 in., or the same level as the car floor. The motors and brakes are controlled by pedals, while the doors are controlled by small hand levers which actuate the door engines. Directly in front of the operator, mounted on the control desk, is a panel containing the air-brake gages and signal lights for his information. The electric fare register may be operated either from a lever on the control board or from a pedal at the right of the brake and reverse pedals. The necessary switches and fuses are within easy reach inclosed in a cabinet conveniently placed at the left of the operator's position.

While the standard exterior painting scheme of bronze green and cream is retained for the exterior, the interior is finished in a light apple green, stippled on a white background, making a very pleasing appearance.



In the sample Philadelphia car the control equipment is assembled in a cabinet convenient to the car operator. Foot control and brake are used.



Single-reduction gearing with a ratio of 7.2 to 1 and flexibly mounted motors are features of the Brill truck used in the Philadelphia car

Chief interest in the car centers on the driving and braking equipment. The car is mounted on two Brill No. 84-E trucks which were designed for light weight and to provide sufficient space for mounting a pair of motors with single reduction drive.

Fundamentally the trucks follow standard practice, the bolsters being of cast-steel section with integral pads for center and side bearings and with pockets cast in each end to receive the tops of the coil springs of the graduated spring system. There is a long coil spring imposed between the pocket in the end of the bolster casting and the center of the longitudinal leaf spring, the outer ends of which are supported from the truck side frame through twin link hangers. The forged side frames are modified to take the new compensating wing-type journal boxes. These are attached to drop extensions of the side frames beyond the axles. The boxes are pivotally supported from the side frames by hardened bushed bolts. This reduces the number of parts as compared with the pedestal type, eliminating attendant wear and noise, and producing even shoe wear. The journal bearings are of babbitt-lined brass without wedges.

The truck transoms are of structural steel angles spaced on each end of the bolster and supported from the side frames by flanged gusset plates with driven bolts. End frames of the same material are bolted to projections of the side frames. The wheel-brake rigging is of the conventional type supported on half ball hangers. The shoes are inside hung with a one-piece brake beam. Lubrication is with high-pressure grease fittings. The axles are of the A.E.R.E.A. standard type and are designed to take the single-reduction gear unit. The wheels are of rolled steel of 26-in. diameter. Four silencing blocks of wood are attached to each wheel.

Two unusual features of the truck are a self-contained single-reduction drive made by the Tool Steel Gear & Pinion Company, and auxiliary magnetic rail brakes. The drive consists of a single gear and pinion with a ratio of 7.2 to 1. The gears are made of alloy steel, having spur teeth with a smaller face and pitch than is usual with standard motor drive. This gives sufficient road clearance with 26-in. wheels. The gear is mounted on the axle with plain brass bearings, while the pinion is mounted on roller bearings. Both of these are self-

contained in an oil-tight split aluminum housing mounted on the axle and supported at the pinion end by a trunnion link.

The motor equipment on each truck consists of two GE-298-H high-speed motors placed transversely between the axles and the truck transom. These are connected to the reduction gearing through a double universal coupling. On one truck the coupling is made of flexible disks, while on the other truck there is a short shaft with universal joint. The motor and pinion end of the gear unit is flexibly supported from the truck frame by a cast-steel spider extending from the transoms to the end frames on approximately the longitudinal center of the truck, and with extending arms to accept the motor mounting and pivotal end of the trunnion link.

For additional safety during emergency stops from high speeds, the trucks are fitted with magnetic rail brakes located in individual housings over each rail between the wheels and hung from the transoms and transom supporting plates of the trucks. The magnetic shoes when inoperative are carried approximately 1½ in. to 2 in. above the rail. Each is equipped with two air cylinders with spring return and carries the magnet coils for energizing.

The two air cylinders on each magnetic brake are piped together and are connected to a cross pipe which is attached to the top of the transom angle with a connection at the center of the truck to the body air-brake piping. This connection is a looped air hose supported on the truck and body in a manner similar to the motor leads. The air piping is of copper tubing, and by the arrangement described permits equalization of air in all the cylinders.

Dimensions and Weights of Car Trucks

Wheelbase	5 ft. 6 in.
Track gage	2 ft. 2½ in.
Distance between centers of side frames	6 ft. 4 in.
Wheel diameter	26 in.
Wheel tread	2½ in.
Flange height	¾ in.
Flange thickness	1 in.
Size of journals (MCB type)	3¼x7 in.

Weights:	Front	Rear
Four wheels, lb.	1,020	1,020
Two axles, lb.	712	712
Truck frame, lb.	3,486	3,486
Two motors, lb.	1,820	1,820
Two speed reducers, including gears, pinions, housings and links, lb.	502	502
Two disk couplers, lb.	64	85
Magnetic brake guide, lb.	160	160
Magnetic brakes and fittings, lb.	440	440
Total weight, lb.	8,204	8,225
Total weight for two trucks, lb.	16,429	

While the magnetic brakes may be used separately if desired, in an emergency application both wheel air brakes and rail magnetic brake are set at the same time. When this is done the stopping distance and time are greatly reduced. In applying the brakes, the first movement of the shoe toward the rail is effected by passage of the air into the cylinders, which forces the shoe within magnetic contact distance of the rail. At the same time the coils are energized and the shoes are pulled to the rail, by magnetic attraction, the remaining distance of ¼ to ⅜ in. The magnetic drag of the shoe on the rail lasts for a predetermined time, with automatic release by cutting off the current to the shoe, which then returns to its original position through the pressure of piston springs.

Washington Experiments with Street Markers

WHITE rubber insets are the latest of a number of devices to be tried by the Washington Traffic Bureau with the aim of developing a satisfactory traffic lane marker. Two street corner installations of this kind have just been made at busy intersections for test purposes. The insets are in the shape of a rectangular box with slanting sides, 3 in. wide by 2 ft. long by 3 in. deep, the depth apparently being made to conform to the average 3-in. depth of asphaltic pavings. The rubber box is filled with asphaltic material similar to that of the paving and bedded in a trench cut in the road. Additional paving material is placed around the edges of the inset, to present a smooth surface. Holes are provided in the sides of the box through which the filler material may bind with the roadbed asphaltum.

Though the insets appear to keep their white surface characteristic and are expected to be as permanent as the roadbed in which they are incorporated, the disadvantages of an expensive installation and a somewhat disrupted paving surface are attached to their use. As the asphalt filler material cannot be compressed to the same density as the pavement, it is believed that the action of trucks and heavy vehicles constantly crossing it will press it below the level of the pavement. A cold asphaltic concrete filler was first tried out in a coarse aggregate pavement, with indifferent action. Better results were obtained with hot sheet asphalt. Another objection, which also applies to Monel metal buttons, is that they constitute a permanent installation at some expense which would be totally lost when the roadbed is to be replaced. Such replacement occurs at the rate of 300,000 sq.yd. annually in the District of Columbia.

White paint of the latest specifications furnished by the Bureau of Standards has proved itself a cheap and practical means of marking, except when paint machines are to be used. Paint probably will be extensively utilized for many years, being gradually replaced by more permanent marking. Specifications call for approximately 20 per cent zinc oxide, 65 per cent lithophone, and 15 per cent other paint pigments, mixed with thin varnish. These proportions give a brilliant and durable white finish, which dries within an hour. The paint, however, is somewhat sticky for machine use.

Strips of white canvas on rubber mat backings were tested in the effort to find a practical and permanent form of marker. It was found that insufficient traction was exerted by the rubber mats to hold the canvas in place, resulting in large sections of the marker being torn up by the sudden braking of wheels, or being distorted into zig-zag lines.

Another device tried was a patented white cement filler, somewhat similar to "roadrite," which was placed in a shallow trench dug right along the lines of a cross lane. This material depressed below the level of the pavement and discolored within a week.

Despite continued experiments with other forms of guides, Monel metal buttons have thus far proved to be the most satisfactory traffic marker, according to M. O. Eldridge, assistant traffic director. They will be installed on cross lanes throughout Washington as fast as funds allow. Traffic plans contemplate the installation of the buttons and metal strips on some of the main boulevards, and, eventually, in parallel lanes to aid in the elimination of traffic weaving.

Co-ordination of Transit Facilities

Proposed for St. Louis

Special commission recommends that one management run all car and bus lines. Improvements that can be made in surface transportation should defer the need of rapid transit for some time.

FOR the past two years a transportation survey commission, created by the City Council of St. Louis in June, 1928, has been investigating conditions covering all phases of transportation, traffic and matters related thereto in the city. Specifically included in its duties were investigation of general street and highway plans and related matters; mass and public transportation, including rapid transit, street railway and bus service; taxicabs and service cars; the ways and means whereby the co-ordination and operation of such transportation facilities shall be brought about and covered for the benefit of the public, and relief of general traffic congestion. E. J. Russell, of Mauran, Russell & Crowell, architects, was appointed chairman of the commission. The Mayor, other prominent city officials and business men, including one of the state public service commissioners and the president of the St. Louis Public Service Company, were members.

The commission selected Kelker, De Leuw & Company to conduct the actual survey. This firm submitted eleven reports. These included plans for improving and co-ordinating existing transportation facilities; a rapid transit plan; a detailed survey of traffic conditions; and drafts of several tentative ordinances and legislative bills for consummation of the plans.

When the commission was created there was a widespread belief in St. Louis that rapid transit was necessary immediately. Accordingly, the first investigation was that of a system to comprise (1) high-speed radial rapid transit lines with limited stops for long-haul traffic; (2) local street railway lines feeding the rapid transit lines, and (3) local motor bus lines serving as feeders to street cars and rapid transit lines and providing extensions in sparsely settled districts.

At the outset, the consulting engineers recommended that one company should acquire and operate all of the existing local subways and elevated structures. Further study showed that many advantages would result if all local transportation facilities could be co-ordinated and operated under one management. Since in an extended program for improvements and additions the problem of financing becomes of paramount importance, it was decided to base the unified transit system upon a terminable permit with necessary safeguards.

Financing of rapid transit lines presented additional difficulties. It was pointed out that elevated railroad construction requires about 25 times the capital necessary for street car tracks, and subways approximately 50 times as much. Accordingly, if the entire cost of rapid transit structures is to be borne by the car rider, the portion of his fare necessary for fixed charges would impose an undue burden on him. As a result of the studies, it was concluded that when rapid transit lines in St. Louis are built they should be financed in part by special assessments.

A survey of the street railway service convinced the engineers that it is susceptible of many improvements, making it possible to defer expensive rapid transit construction. Checks of the actual running time showed that some of the causes for the slow movement of street cars were narrowness of the streets, parking of automobiles, density of traffic on intersecting streets, short distances between street intersections, old type cars requiring too much time for loading and unloading, and too many stops.

With the majority of the lines of the Public Service Company equipped with cars suitable for mass transportation, with stopping places reduced to an average of eight per mile (660 ft.), with more direct routes in the intermediate and outlying districts, and with improved routing downtown, it was held that the running time could be materially reduced and kept within a reasonable time for travel to and from business or employment for a number of years to come.

Changes in routing of several of the street railway lines were recommended at an estimated cost for new tangent track and special work of $726,000. Left turns would be reduced 82 per cent by the proposed routing.

Street Car and Bus Co-ordination Urged

Following up their theory that so many improvements could be made in the existing transportation facilities as to defer the necessity for rapid transit facilities, the engineers submitted a plan for the co-ordination of street railway and motor bus service. Wasteful duplication of service was found in many sections of the city. In the rush hours, the bus company does not satisfy the demands, and the overflow traffic must be handled by street cars. For this reason, the number of cars in the rush hours is more than three times those during the non-rush. This has an important and direct bearing on the rate of fare. The street cars were found to maintain a more frequent service, and although on the average they handle more than twice as many passengers per vehicle-mile as do the buses, their average speed is equally fast.

Because of their flexibility, the engineers believe that

buses can be used to advantage to provide radial express service within about 3 miles from the business center. In general, the plan proposes that, where an existing street car route closely parallels an existing bus route, the bus line should be abandoned or changed to express service. Where express service is to be furnished by motor buses, the existing equipment should be used only until more suitable buses can be substituted.

It was generally agreed by the commission that new capital must be obtained for any major improvements. This flow of capital to St. Louis will likely be determined largely by the terms and conditions under which the several companies operate. Accordingly, an ordinance was drafted by the engineers incorporating the fundamental principles of service at cost. Under this the company would be allowed to charge to the cost of the service: (1) operating expenses, including taxes; (2) payments into authorized reserve funds; (3) a fixed return on the initial capital value, which would be equivalent to the city purchase price; (4) a return equivalent to the cost of money for extensions and additions; (5) compensation to the city; (6) compensation to the company. Any surplus would form a barometer fund.

Compensation received by the city might be used: (1) to acquire any bonds represented in the initial capital value; (2) to purchase any extension bonds at par on issue; (3) to commute fares by paying any deficits arising from operation into the barometer fare fund, or any other agreed method.

The city and company, by agreement, would determine the following items for insertion in the ordinance, subject to any necessary approval by the state commission: (1) initial capital value; (2) initial rates of fare; (3) initial percentages of gross receipts to be paid into the reserve fund; (4) appointment by the Mayor of a transit commissioner with general supervision over the operation and accounting of the company; (5) co-ordination of the city and suburban services furnished by the company. The recommended term of the franchise was 50 years—the maximum provided by the city charter—with provisions for renewal and with an option for the city to purchase before that time.

A report on the transportation needs of St. Louis covered the possible improvements in the transportation facilities, traffic regulations and street system. These improvements, the engineers estimated, would require capital expenditures of about $23,800,000 during the succeeding five years.

Five recommended methods of obtaining faster, more comfortable and more convenient street railway service included a comprehensive re-routing, a reduction in the number of stopping places, purchase of modern cars, installation of additional feeder bus lines, and extensions of street car lines.

At present there are about 1,350 street cars on the system, of which only 250 are modern. It was recommended that approximately 800 modern cars be substituted, especially on the lines running into or through congested areas, 400 for replacement of present equipment and the remainder as additions. Purchase of these would involve a capital expenditure of about $12,800,000. Car line extensions on six streets were recommended at a cost of about $1,338,000. Fifty buses were recommended as additions to the present feeder bus lines to serve districts of the city not now adequately served. The estimated cost, including garages, was about $512,000. All these expenditures for improvements should be spread over five years, $4,800,000 in each of the first three years, and $4,700,000 in each of the last two.

Between 350 and 400 "service cars," which are private automobiles carrying passengers for hire, operate over approximately 50 route-miles, and charge fares from 15 to 25 cents a person. The engineers found many objections to their use and recommended the substitution of small, high-speed, de luxe buses.

Studies of a rapid transit plan indicated that subways for street cars in the business district would not provide traffic relief in keeping with their cost, would be of little benefit to street car patrons, and other and less costly means of traffic can and should be employed to the fullest extent. A comprehensive rapid transit plan to meet future needs should be adopted now and be constructed as and when any of the routes are necessary and can be financed. Rapid transit structures preferably should be located under or upon wide streets or highways which have space for such structures, thus obviating the expense of procuring a private right-of-way.

Rapid transit lines proposed for future construction, all double track, include (1) a line from the city limits along Manchester Avenue, Chouteau Avenue, Broadway, Cass Avenue and Easton Avenue to the city limits; (2) from the city limits along Gravois Avenue, Ninth Street, Fourteenth Street, Twentieth Street and Florissant Avenue to the city limits; (3) from the city limits along Delmar Avenue and Olive Street to a suitable terminal east of Third Street; (4) from a connection with the Gravois Avenue line along Compton Avenue and Michigan Avenue to Tesson Street.

It was estimated that if these lines were all constructed as subways, the modified plan, as proposed by the engineers, would cost $214,331,000. If subways were used extending to the outer limits on the first and second step proposed in 1926, with elevated structures beyond that, the total cost would be $144,929,000, and if subways were used to the outer limits of the first step only and elevated beyond, the total cost would be $87,052,000.

For traffic regulation and control the installation of traffic signals at 90 intersections in the business district and 88 in the intermediate and outlying districts was recommended at an estimated cost of $279,000. One hundred safety zones of the concrete platform type and upward of 200 of the metal mushroom type were proposed at an estimated cost of $65,000. Prohibition of parking in the business district during business hours is inevitable, states the reports.

Besides the reports of the commission's engineers, several communications from others are included. Stanley Clark, president of the St. Louis Public Service Company and a member of the commission, proposed immediate construction of street car subways in the downtown district. Two plans of re-routing cars are also proposed. In general, these recommendations are along lines similar to those of the commission's engineers.

Widening of a number of existing streets and construction of some new streets in and adjacent to the present business district are recommended. It is proposed that some of the streets, particularly near the river, be double-decked. It is stated that the plans, as proposed, will stop shifting of the business district, stabilize property values at its eastern end, and assist traffic circulation throughout the city.

Minority reports were presented by two members of the commission. Both of these members dissented principally from the idea of granting a terminable permit to the operating company. In practically all other matters these two members concurred in the report.



Although Public Service Co-ordinated Transport operates more than 500 buses in Newark, it continues to operate approximately 450 electric cars. Company officials estimate that 1,000 additional buses would be required to take the place of these cars, and believe that the consequent congestion would be intolerable

How Public Service Co-ordinated Transport uses buses to supplement and extend rail service and to replace single-track lines. In larger cities the electric car remains the backbone of the system. This article is based on a paper recently presented before the Transportation Group of the New York Section A.I.E.E.

Development of the Bus for

Mass Transportation

By

A. T. WARNER

General Manager in Charge of Traffic

Public Service Co-ordinated Transport, Newark, N. J.

STREET car operating men, who were brought up on the theory that public transportation must be safe, are largely responsible for the rapid development of the motor-driven bus. When the vehicle was first placed in their hands as a medium to care for their patrons, its safety was so questionable, the operation was so uncertain and unstable, that they demanded of the manufacturers and automotive engineers immediate developments which would make the bus a safer vehicle for the highways.

The bus of 1922 was a far cry from those which we are placing on the highways today. It was a truck chassis with a passenger body on it. It had a four-cylinder motor which was designed for truck use and totally unfit for the frequent stops and starts, the high acceleration desired, and other characteristics inherent in bus operation. Many of the vehicles were equipped with hard tires, and even pneumatics were high-pressure and single in the rear; the body was high, with three and sometimes four steps; springs were such that there was a "kick-up" toward the rear; seats were uncomfortable and narrow, and there was no adequate light, heat or ventilation. If the weather was wet, pavements slippery or icy, these vehicles were positive menaces on the highways.

We all realized that our first duty was an immediate change in chassis design to lower the center of gravity

and to create a safer vehicle. This meant an entire change in spring arrangement. These were underslung, and auxiliary leaves were introduced to care for the variable load factor. About the same time, dual tires for the rear axle were introduced. This went a long way toward establishing safety by reducing skidding. The manufacturers started to design engines for bus use and adopted the six-cylinder motor. The lowered chassis immediately allowed an increase in length and, consequently, in seating capacity, and success with the six-cylinder engine has increased horsepower from the 40 hp. engine of 1923, to those of 150 and 180 hp. which are being used today.

In 1925 the gas-electric hook-up was first started experimentally and proved an immediate success. We are now operating approximately half of our fleet of 2,500 with gas-electric buses. We use them entirely for city service in congested areas and for low-speed work. We believe them superior in this type of service, both from the point of view of the operator, the passenger and the maintenance department. City service with us means a speed of 8 or 9 m.p.h., depending upon congestion. It means that there will be ten stops per mile.

Every operator, therefore, in the course of nine hours' work, would be compelled to make 3,600 motions with his gear shift lever, if he was driving a gear shift bus, and these 3,600 motions would only include passenger stops, and not traffic delays, slow-ups, or signals. Of these 3,600 motions, three-quarters of them are in process of acceleration. There was, therefore, a tremendous temptation always confronting the operator to start in second or third speed, abusing the clutch, jerking the passengers and damaging the equipment. Before we went to gas-electric operation approximately 80 per cent of our road failures in city service resulted from trouble back of the motor. The gas-electric drive eliminates the gear shifting and is consequently not only a great benefit to the operator, but gives the passenger a smoother and more comfortable ride and creates, we believe, a saving in maintenance. We have confined our gas-electric operation entirely to city service where a large number of stops per mile is the main factor to be considered.

As we have progressed in the improvement of the chassis, engine and driving mechanisms, we have, likewise, been able to produce a better body, and have been supplied with seats and other accessories constantly improving in comfort, rider appeal and performance. Tire development is only one example of this. In common with many other large companies, we do not buy any tires, but tire service on a mileage basis. Our first tire contract showed an average mileage per tire of approximately 8,000 miles. We now have balloon tires on practically our entire fleet, and this year our tire mileage will be approximately 25,000 miles per tire—a 300-per cent improvement in the course of six years, certainly a wonderful record. For this we have the energy, research and ability of the tire manufacturers to thank. In the same way, lighting, heating and improved ventilation have come about, as a result of infinite tests, care, patience and money. The bus we are putting on the streets today is a vehicle as safe, as comfortable, and as fast as a private automobile, and it is because of these factors that the bus has taken its present position in the transportation field.

In 1923, which was the first year of our bus operation of any magnitude, we operated 500,000 bus-miles, carried approximately 2,000,000 passengers, and ran at a speed of 8 m.p.h. Last year, 1929, we operated 82,000,000 bus-miles, carried 344,000,000 passengers, and our speed was 10.5 m.p.h.

From an operating point of view, the advantage of the bus is its complete flexibility. There is nothing to hold the bus to either a fixed position on the street or to a fixed route. In case of congestion, fire, disturbance of any kind, the bus can be rerouted either around an adjacent block or to a larger extent. Express service can be installed by taking loaded equipment off congested thoroughfares and expressing them via the fastest possible route. Curb pick-up and delivery is another important item of service to the shippers that has popularized the motor bus.

We are very firmly of the opinion that in our larger cities, where mass transportation and street congestion are important factors, the operation of electric cars on rails must still be considered as the backbone of local transportation. Buses can be used in many ways to co-ordinate with this service; to supplement it; to extend it; to tap new areas; to furnish new crosstown services; to replace single-track trolley operations and to furnish de luxe service at a higher fare. But the development of the art has not yet reached the stage when bus operation can supplant entirely the electric car.

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RELIABILITY

Features Reading's Power Supply

By C. L. DOUB
Assistant Engineer, Reading Company
Philadelphia, Pa.

INITIAL plans for the Reading electrification authorized in 1928 included only suburban lines within a radius of about 25 miles from Philadelphia on four branches, with the view that it was the beginning of a program of more comprehensive scope. During 1930 extensions were authorized to Doylestown and to West Trenton, respectively about 35 miles and 33 miles from Reading terminal. These additional authorizations bring the total up from the original 50 miles of route and 120 miles of single track to 69 miles of route and 161 miles of single track. Five miles from Philadelphia to Wayne Junction has four tracks, the Doylestown and Hatboro branches are principally single-track, and the remainder is principally double-track. East of Neshaminy Falls is also principally four-track, and all are being electrified.

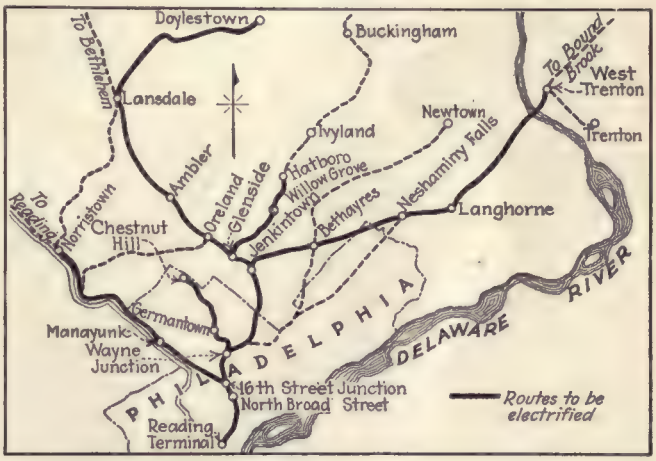
Since the ultimate plan is to electrify through passenger and freight service, designs are being made for all classes of trains in the present electrification so that the system can be extended readily at any time without material changes in the present power supply, excepting as to additions of equipment. These plans include possible electrification to New York, Bethlehem, and Reading, involving some 250 route-miles and about 1,000 track-miles including yards and sidings, which may be served with power from the Philadelphia area.

The single-phase alternating-current system, with nominally 11,000 volts on contact wires and with actual design for 12,000 volts, is being used.

The power and substation layout was based on one source of supply at Wayne Junction, about 5 miles from Reading Terminal, near the electrical center of the Philadelphia load. Adequate property was available, and the location is at an advantageous junction point for the railroad lines, and situated favorably as regards other railroad operating facilities. It is also advantageous for the Philadelphia Electric Company, from which the power will be purchased, being close to its principal Philadelphia load center. The power company is providing at Wayne Junction a 60-cycle to 25-cycle frequency changer station exclusively for the railroad load. This station will have initially two 15,000-kw. 70-per cent power factor, 21,400-kva., motor-generator sets and space for six such sets with an ultimate total installed capacity of 90,000 kw. and 128,000 kva.

The railroad substation at Wayne Junction will receive power from the power company at 13,200 volts, 25 cycles, single phase, where it will be transformed and distributed to the railroad's contact system and transmission lines.

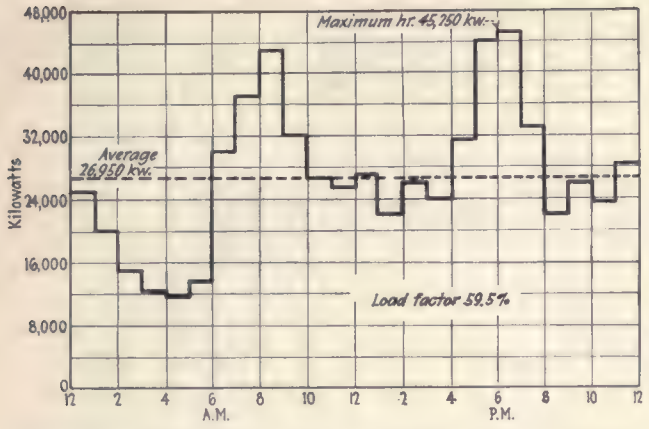
Due to the heavy traffic density on the Reading company trackage, which is used jointly for suburban, through passenger, freight and switching purposes, the greatest flexibility of train operation must be provided. An unusually large number of interlocking plants permit the most flexible use of tracks, and it was considered necessary to provide sufficient sectionalizing of contact lines that this flexibility in use of tracks would not be impaired by the electrical system. The location of these



Recent authorizations have extended the Reading electrification to include 69 miles of route and 161 miles of single track

interlocking plants and junctions of the various branches made it advisable to install switching stations with complete automatic protection at intervals of approximately 6 miles, regardless of power transmission or voltage regulation requirements, and it was considered advisable to make these stations complete substations by the addition of transformer equipment. There would be further advantage of substations at comparatively close intervals in reducing the total induction from the electrical system.

For the initial railroad power installation it was decided to use the three-wire system with a superimposed high-voltage transmission line to serve future extensions into more remote territory. The voltages chosen for the three-wire system were 12,000 between trolley and rail, 24,000 between "feeder" and rail, and 36,000 between trolley and feeder. The two-wire, single-phase transmission line would be 66,000 volts. Electrification beyond the initial territory could be carried out by using additional three-wire distribution fed from one or more outlying points through suitable stepdown transformers. These transmission lines become simple lines from Wayne Junction to one outlying feed point on each branch, with a minimum of high-voltage switching equipment.



Estimated weekday loads for the electrification when extended to Bound Brook, Bethlehem and Reading will reach an hourly maximum of 45,250 kw. in winter

The arrangement permits tapping the 66-kv. lines at any desired intermediate points to augment the three-wire system through so-called "three-winding" or tapped-secondary transformers, should the growth of the electrical loads make it desirable. Space is being reserved at certain of the initial intermediate substations so that at any time they may be readily extended to become such step-down substations with small additional cost.

Substations for the initial electrification will have installed capacity as follows:

Substation	Transformers Number	Transformers Kw. Each	Substation	Transformers Number	Transformers Kw. Each
Reading Terminal	3	2,000	Bethayres	1	2,000
Wayne Junction	3	8,000	Neshaminy Falls	2	2,000
Jenkintown	2	2,000	Yardley	2	2,000
Ambler	1	2,000	Chestnut Hill	2	2,000
Lansdale	2	2,000			
Doylestown	1	2,000	Total	3	8,000
Hatboro	•1	2,000	Total	17	2,000

Low-reactance auto-transformers of 2,000 kva. are used excepting at Wayne Junction, where 8,000-kva. transformers step up from 13.2 kv. (generator voltage) to trolley-rail voltage of 12,000 and trolley-feeder transmission voltage of 36,000. All transformers are nominally rated with 50 per cent overload for two hours, and 300 per cent for five minutes. Both types are oil-insulated, self-cooled.

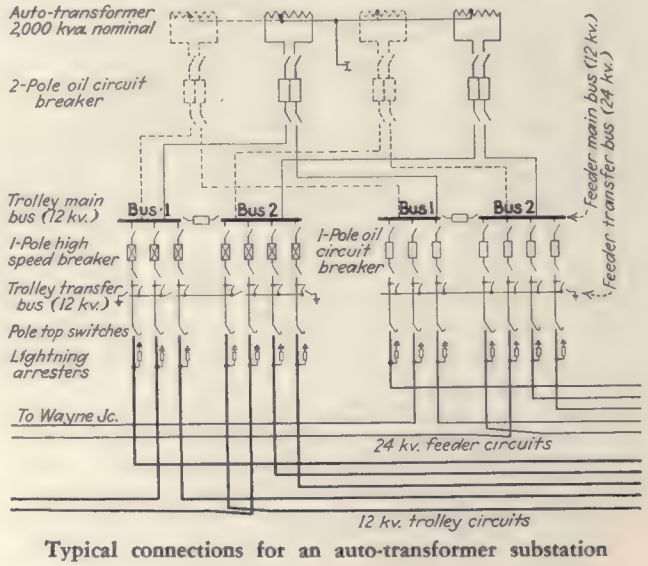
All contact lines in each direction from each substation are fed independently by high-speed circuit breakers. Duplicate feeders at 24 kv. to ground are installed along each portion of the route, excepting the single-track branches, with oil circuit breakers serving each end of each feeder. The substations are, therefore, switching stations for all feeders as well as all trolley circuits.

The typical station includes a single-conductor trolley bus and a single-conductor feeder bus, each serving the respective outgoing lines and each being fed through two-pole breakers from the auto-transformers at that station. The most important stations include automatic oil circuit breakers for sectionalizing each bus, with additional remote manual-operated disconnecting switches for further localizing trouble in these buses. The remainder of the stations have remote manual disconnecting switches only in the bus, but if desired, oil circuit breakers may be installed later for bus sectionalizing. Each bus or bus section has automatic differential protection against faults on the bus or immediate connections. This locks out all breakers connected to that section of the bus but to allow restoring service immediately if the trouble clears itself, these lock-out relays may be reset through the supervisory control system.

Further flexibility in switching of lines and maximum operation without stub-end feeds are made possible through a transfer bus for each trolley and feeder bus with remote manual-operated disconnecting switches for each outgoing line and transfer bus sectionalizing switches. These will be used for routine breaker and bus maintenance as well as in case of trouble. This bus may be used to connect any two lines together to feed from one circuit breaker, or, by use of transfer bus sectionalizing switches, may connect more than one of such pairs in certain combinations. With this grouping of the outgoing lines, de-energizing a section of the main bus will de-energize only one track or one feeder in any territory. Also when a main bus is out, all lines served by that section can be grouped through the transfer bus to be served by other breakers in the station so as not to impair the relay protective scheme. The transfer bus for the feeder is somewhat less necessary than for the contact lines since a main bus outage will not kill all transmission lines in one direction. This transfer bus will, however, permit the maximum use of the feeder transmission copper in the event of bus or circuit breaker troubles or during routine maintenance. Ground switches are being installed upon the transfer buses so that they may be used also as ground buses under certain special conditions.

Outgoing lines are all provided with horn-gap disconnecting switches on the substation terminal structure so any connections within the substation limits may be de-energized for working purposes. Lightning arresters are being installed upon the terminal structure, connected at the line side of the switch through "live line clamps" to permit them to be disconnected readily. Remote manual group-operated disconnecting switches isolate each circuit breaker.

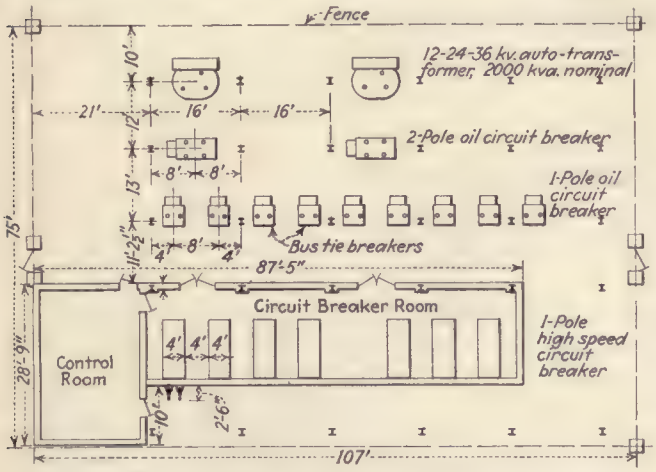
High-speed circuit breakers feed all trolley circuits. Both oil and air-type circuit breakers have been developed for 12,000 volts within the last several years and have been thoroughly tried out in heavy-duty service. The circuit breaker chosen was the General Electric JRA-32 air-break high-speed type with a rating of 1,500 amp. continuously at 15,000 volts, 25 cycles. This breaker has a single-pole interrupting capacity of 50,000 amp. at 12,000 volts, and is specified to perform 50 "OCO" duty cycles consecutively at two-minute intervals as compared to the usual rating of only two "OCO" duty cycles which



Typical connections for an auto-transformer substation

is standard for the normal oil circuit breaker. Its principle is the so-called "impulse tripping" on short circuits depending on the rate of change of 25-cycle current from one half cycle to the next. It is a development of the indoor type of breaker, although it can be arranged for outdoor mounting by the addition of suitable weather-proofing covers.

The control and breaker building is laid out parallel to the main tracks and at one edge of the substation. An adjacent parallel bay of the outdoor substation provides for the single-pole feeder breakers serving the outgoing 24-kv. lines and also single-pole breakers of the



The auto-transformer substations include outdoor high-tension equipment with indoor circuit breakers

same type which are used as bus tie breakers. The next parallel bay provides for the two-pole transformer breakers connecting transformers to trolley and feeder buses, beyond which is the transformer bay along the opposite side of the auto-transformer station. Single-pole feeder breakers and two-pole transformer breakers are all outdoor oil breakers of the newly developed Westinghouse "deion grid" type. Outgoing lines may be taken out at either side of such a substation and the substation located most advantageously for the use of a siding or of main line tracks along one side from which to handle the transformers.

In order to simplify design and maintenance, a unit type of construction was adopted for auto-transformer stations so that all stations will be similar except for the number of units required for the varying numbers of transformers and outgoing lines. The typical unit consists of a 16-ft. section containing two trolley breakers, two feeder breakers, one transformer breaker, and one transformer. A particular station includes the necessary number of units with such items of equipment in each unit as are required. Trolley and feeder breakers are each located on 8-ft. centers and are so connected that the corresponding outgoing lines are staggered and are run parallel and horizontal, with 4-ft. spacing, to a feeder structure over the tracks opposite the substation location. Connections to lines at the feeder structure are made by taking vertical leads upward to 24-kv. feeder lines and downward to the catenary system.

The resultant layout is compact, simple and clear. The space requirements and over-all height are moderate, but electrical and working clearances around apparatus and connections are liberal.

The portion of the main station supplying trolley and feeder lines at Wayne Junction follows the same unit design as for auto-transformer stations, with exactly the same arrangements and spacing of apparatus. There is added, however, a section of station for primary power supply to the transformers, which is not necessary for auto-transformer stations. This extension includes a bay for primary 13.2-kv. double-pole circuit breakers adjacent to the transformer bay, beyond which are two bays for the 25-cycle, 13,200-volt ring bus with generator and bus sectionalizing breakers, future bus tie reactors, etc.

The ring bus is single phase. Space is reserved for a third conductor to be added to change to a three-phase bus should parallel operation of frequency changer units in the future make this desirable in order to hold these machines in synchronism. The bus is designed for an ultimate of six sections of ring, each to be served by one 15,000-kw. frequency changer set and each section to feed two 8,000-kva. transformers, one with three windings for the three-wire distribution system and the other to step up to serve the 66-kv. transmission lines. Complete automatic protection would be provided for each bus section and additional short circuit limiting reactors would be installed at several points in the bus for connection when all machines were operating. The initial portion of the station will include only a portion of the ring bus, so arranged so as to provide three sections in straight line, each feeding one 8,000-kva. transformer, and the end sections being fed by the two frequency-changer units installed initially.

The initial Wayne Junction station serves ten outgoing contact lines and six outgoing feeder lines. As additional tracks are electrified, it is planned to extend the three-wire portion of the station to serve twenty outgoing 12-kv. trolley lines and eighteen outgoing 24-kv. feeder lines, and to make a further extension of the station to provide a 66-kv. section containing a possible ultimate of seven 8,000-kva. step-up transformers, bus, and eight double-pole 66-kv. breakers for duplicate outgoing lines toward Bethlehem, New York, Reading, and the transmission system of the Baltimore & Ohio Railroad, all as and if required. The 66-kv. transmission lines toward New York can be extended to connect with the system of the Central Railroad of New Jersey, over which the Reading Company has trackage rights between Bound Brook and Jersey City, its New York terminus.

The Wayne Junction substation building includes a two-story control house, the second floor of which will be load dispatching headquarters for the entire electrical system. A supervisory control system is provided for the operation of all of the present substations, none of which will be attended, and the load dispatcher will directly control all circuit breakers, motor operated disconnecting switches, etc., from an operating desk. The layout is made for future extensions to cover all of the through passenger and freight territory above referred to, if it is desired to perform this operation from the Philadelphia headquarters. The railroad load dispatcher will be in close telephone communication with the railroad train dispatchers and also with the load dispatchers and operators of the Philadelphia Electric Company system supplying the Reading company.

The control buildings for all substations will include switchboards for control and protection of all lines, storage batteries and charging equipment, and supervisory control equipment operated directly from the Wayne Junction load dispatcher's headquarters, together with the maintenance and inspection facilities required.

More Power

By

J. W. WELSH

Assistant to the President, Cleveland Railway

Motors of radically higher horse-power are needed. Efforts to reduce energy consumption may be false economy. Possible savings in transportation expense resulting from higher speeds are greater than the added power cost

AUTOMOTIVE engineers have not been afraid to use power freely, even extravagantly, to secure pre-eminent performance, while electric railway engineers have bent every effort to use as little power as possible. As a result, the automobile has outstripped the electric car in acceleration, maximum speed, and in the general flexibility of its operation. American automobiles compared with foreign types have admittedly employed larger engines and faster gear ratios, partly because gas is cheaper and taxes are lower here, but more than anything else, because the *sine qua non* of motordom today is power. A speed margin of 5 per cent has satisfied electric railway engineers in applying motors to cars, while the automobilist has had held before him the thrilling possibilities of a speed margin of many hundreds per cent. What the electric car needs is more torque, continuously, uniformly and copiously available from rest up to the maximum operating speed.

Our researches in the direction of increasing speeds should take nothing for granted. The characteristics of the series motor, admirable as they are, have some notable deficiencies. It is true that, during the first part of the acceleration period, while running on resistance up to the point of applying full voltage to the motors, the series motor is an effective torque machine. During this period, the acceleration may be made as rapid and smooth as conditions will permit. But as soon as the resistance is cut out, the car speed crawls lazily up along the gradual slope of the motor curve at a most aggravatingly leisurely pace.

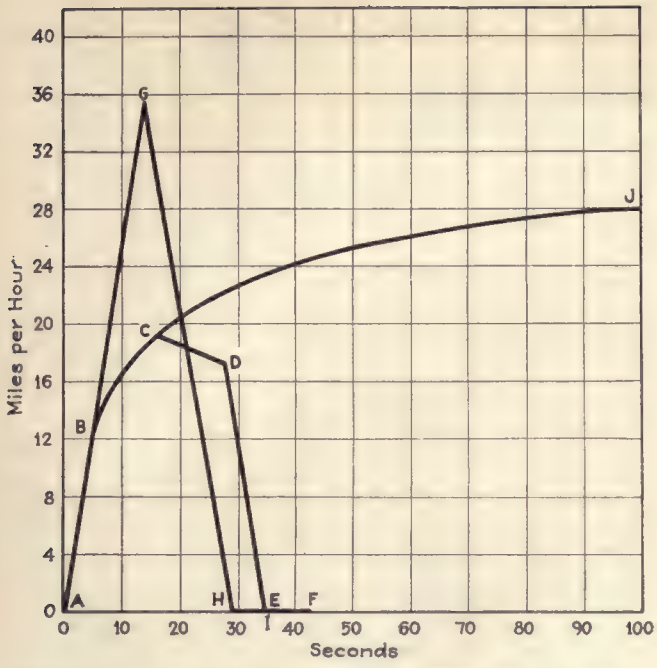
We talk about gearing our cars in city service for free running speeds of 30 m.p.h. or more, and yet, in frequent stop service, it is rarely possible to attain over half these speeds. Even if we do, we have employed a time wasting process during the latter part of the accelerating period. Thus, in a typical case with an initial accelerating rate of 2.5 m.p.h.p.s., 12.5 m.p.h. is attained in five seconds; but it takes 100 seconds to attain the free running speed of 28 m.p.h. This is illustrated in the typical performance curve shown in an accompanying chart.

The reason for this sluggishness in acceleration after the resistance notches are passed is that the torque is being gradually reduced as a result of the weakening of the field. This follows the reduction in current due to increasing counter electromotive force as the speed increases. Further, the free running speed may be increased by weakening the field by the reduction of current in the field windings, by shunting the current around them, or by cutting out a part of the turns. In any case, a higher speed, it is true, is secured, but at a relatively low rate of acceleration. And the reason is that acceleration is proportional to the torque, and the torque is low because of the weakened field.

With the present characteristic in the design of series motors and present methods of application to service, undoubtedly an advantage accrues in many cases by using field control to attain higher free running speeds, and there is no question about its being an electrically efficient method. The objection is the slow rate of acceleration and loss of time that accompanies its use.

In frequent-stop city service the time cycle is, at best, all too short. In the past it may have been satisfactory to handle a service calling for, say, seven stops per mile, with a cycle of 42 seconds, approximately five seconds on resistance points, eleven seconds creeping up on the motor curve, twelve seconds coasting, seven seconds braking, and seven seconds standing. Such a cycle is shown at *ABCDEF* in the diagram. Elimination of the coasting will cut the duration of the run only slightly.

If maximum acceleration can be continued until the current is cut off at a considerably higher maximum speed and the brakes are applied immediately, as at *AGHI* a far higher schedule speed is possible. Obviously, such a cycle demands a material increase in motor horsepower and in energy input.



Speed-time curves for normal and suggested operation

Service: 7 stops per mile — 2.5 m.p.h.p.s., braking
7 seconds per stop — 2.5 m.p.h.p.s., acceleration

Beginning with the typical cycle *ABCDEF*, the run of ¼ mile would be made in 42 seconds. In the fast run, *AGHI*, the same initial acceleration, 2.5 m.p.h.p.s., would be continued up to point *G* at 35.5 m.p.h. Then power would be cut off and the car stopped by the brakes at the same retardation rate of 2.5 m.p.h.p.s., at the end of 28.5 seconds, reducing the total time for the run, including the seven-second stop, to 35.5 seconds. The schedule speed would be 14.5 m.p.h. against 12.2 m.p.h., a gain of 19 per cent. This material gain in schedule speed would involve changes in energy consumption as shown in the following table:

	Ordinary Equipment		High-speed Equipment	
Maximum speed, m.p.h.	19.4		35.5	
Speed at cut-off, m.p.h.	12.5		35.5	
Maximum power per motor, kw	46.2		131	
Maximum kinetic energy per ton, foot-pounds ($\frac{1}{2}MV^2$)	Ft.-Lb. 25,500	Per Cent of Total 56.4	Ft.-Lb. 85,000	Per Cent of Total 51.4
Rotational energy, 5 per cent	1,275	2.8	4,250	2.6
Car resistance	7,540	16.6	11,310	6.8
Rheostatic loss	6,000	13.2	48,000	29.0
Motor and gear loss	5,000	11.0	16,900	10.2
Total	45,315	100.0	165,460	100.0

The first two items, which are more than 50 per cent of the input, represent useful utilization of power in the sense of attaining the objective of transportation service, i.e., speed. The remaining three elements represent losses whose reduction is, of course, desirable.

Comparing the two runs the kinetic energy, increasing as the square of the speed, is more than three times as great for the fast one. The accelerating current is correspondingly greater and the time running on resistance is almost three times as long. The rheostatic losses are eight times as great. This suggests the desirability of an improved control to reduce rheostatic losses, although this is important only in frequent-stop service, as illustrated by this rather extreme example. In general, energy consumption at double the speed is more than four times as great, all other conditions as to stops, rate of acceleration, etc., remaining the same.

Even to suggest such a thing as quadrupling the energy consumption would seem to most engineers almost preposterous, even though it resulted in doubling the speed. It would seem that so great a difference could hardly be justified in balancing the increased cost of energy against the reduced cost of transportation, yet this is not impossible. Here are actual cost comparisons:

	Cents
Present cost of energy per car-mile	3.5
Proposed cost of energy per car-mile (four times)	14.0
Increase	10.5
Cost of trainmen's wages per car-mile	16.0
Fixed charges on cars, shops and stations per car-mile	5.0
Present total car cost per car-mile	21.0
Proposed car cost per car-mile (½)	10.5
Decrease	10.

Here the increased cost of energy just balances the decreased transportation cost. Moreover, this takes no account of the certain increase in revenue, which any recognizable increase in speed has on the car riding habit. This example is given merely to show how far a company may go in increasing its power to secure speed.

But quadrupling the power on electric cars has other justifications. Some 1930 automobile models advertise a rating of 125 hp. for five-passenger vehicles, or 25 hp. per passenger. Present-day street cars may go as high as 200 hp. for 50 seated passengers, or at the rate of 4 hp. per passenger. On this basis we might increase motor capacities six times instead of four.

Obviously, a company is not likely to quadruple its power cost for increased car speeds until it has exhausted other means. First, waste time in schedules should be searched for and cut out, along with a study for stop reduction and more rapid acceleration, all of which increase schedule speed with little or no increase in power. Next, car weight should be reduced. In many new cars it is being cut in two. The fallacy that heavy equipment is essential for comfort and safety at high speeds is being exposed. Low-floor cars, small wheels, and high-speed motors all contribute to this end.

Probably the reason for the reluctance to use more power is that its cost, like every other item of expense, has been subject to rigid scrutiny and every effort made to reduce it. Power-saving campaigns have been the order of the day on most properties. The error in this procedure is the tendency to reduce the use of power at any cost. The energy consumed, as we have seen in the above analysis, may be divided into two parts, one a useful part devoted to bringing the car up to speed and the other a wasted part devoted to overcoming the various losses. Failure to differentiate between the useful and wasteful elements in energy consumption has been the cause of much loss to the industry. In a word, the industry has falsely economized on power, and thus sacrificed the most vital essence of transportation, i.e., speed.

Nobody questions the desirability of reducing power waste; but we have seriously handicapped ourselves in meeting our principal competitor, by failing to use freely and effectively our most distinctive ally, electric power. On the Cleveland Railway, we have felt for a long time that a larger use of power is justified and the experimental work which we have already conducted indicates the economic desirability of a still greater utilization in the future.

Pittsburgh Traffic Signal Controlled by Street Car Movement

DELAYS to street car operation have been reduced as a result of the installation of traffic signal apparatus at Ellsworth and Negley Avenues, Pittsburgh, to prolong the green indication when a car is approaching the intersection. A somewhat similar installation at Louisville, Ky., was described in ELECTRIC RAILWAY JOURNAL, September, 1929, page 835.

The traffic signal at Ellsworth and Negley Avenues has a cycle known as the "non-overlapped four-way amber" which displays a single indication to each street at any instant. The green indication on Ellsworth Avenue and the red on Negley Avenue are adjusted to be displayed

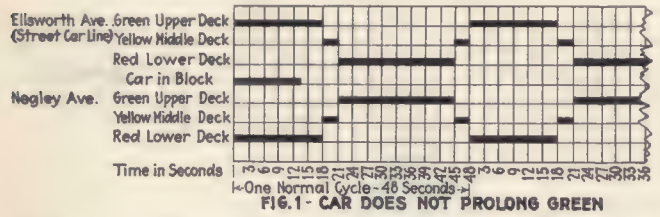


FIG. 1 - CAR DOES NOT PROLONG GREEN

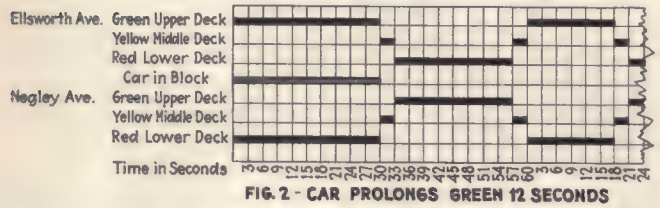


FIG. 2 - CAR PROLONGS GREEN 12 SECONDS

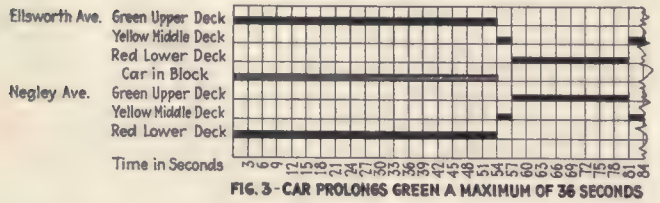


FIG. 3 - CAR PROLONGS GREEN A MAXIMUM OF 36 SECONDS

simultaneously for eighteen seconds, after which both indications change to amber, which is displayed to both streets for three seconds. At the end of this period the amber is extinguished and red is shown on Ellsworth and green on Negley for 24 seconds. Then amber is shown to both streets for three seconds. This cycle is repeated continuously by the motor-driven timer.

On each of the double tracks on Ellsworth Avenue there are two overhead trolley contactors, one set back 300 ft. before the car reaches Negley Avenue and the other placed at Negley Avenue. These contactors are actuated by the passing trolley wheel to form an electrical circuit. If a car passes the first or setting contactor to enter the control block with the signal showing green on Ellsworth, and passes the clearing contactor at Negley Avenue sooner than eighteen seconds from the beginning of the green display, the traffic signal indications are not disturbed by the movement of the car. If, however, the car passes the first contactor during the green display and does not pass the crossing until later than eighteen seconds, the green is prolonged until the clearing contactor is actuated. Then the amber and the red follow in the normal cycle.

It is evident, however, that the car should be able to prolong the green only up to some predetermined limit, and if it does not pass the crossing within that time, then the signal will go to amber and red automatically. In this installation the time-element relay has been set for a green maximum of 54 seconds, being a prolongation of 36 seconds.

Since the cycles will be of variable length as determined by car movements, it is evident that this signal is not adapted to a wave or progressive system involving a number of crossings, but is suitable only for an isolated crossing where there is a main street with heavy traffic and a cross street with much lighter traffic.

It is an advantage with this arrangement to make the green periods for the two streets more nearly equal than would be otherwise possible, and to prolong the green period for the heavily traveled street when the trolley cars with their heavy traffic behind them require it. It will be noted that in no event is the display of the red shortened to the approaching car. The distance the contactor is set back for the crossing is that through which the car moves during the display of the red.

The apparatus for this control was furnished by the Nachod & United States Signal Company. It involves a motor-driven timer, a relay box with contactor-operated relays and a time-element relay together wth four overhead trolley contactors located as described, all of which operate on the ordinary three-decked, four-way traffic signal.

St. Louis Tags Transfer Passengers

DEPARTING in a number of ways from ordinary practice, a new type of transfer has been perfected and put into use by the St. Louis Public Service Company. Adoption of the new transfer system is the result of months of exhaustive investigation and experimentation.

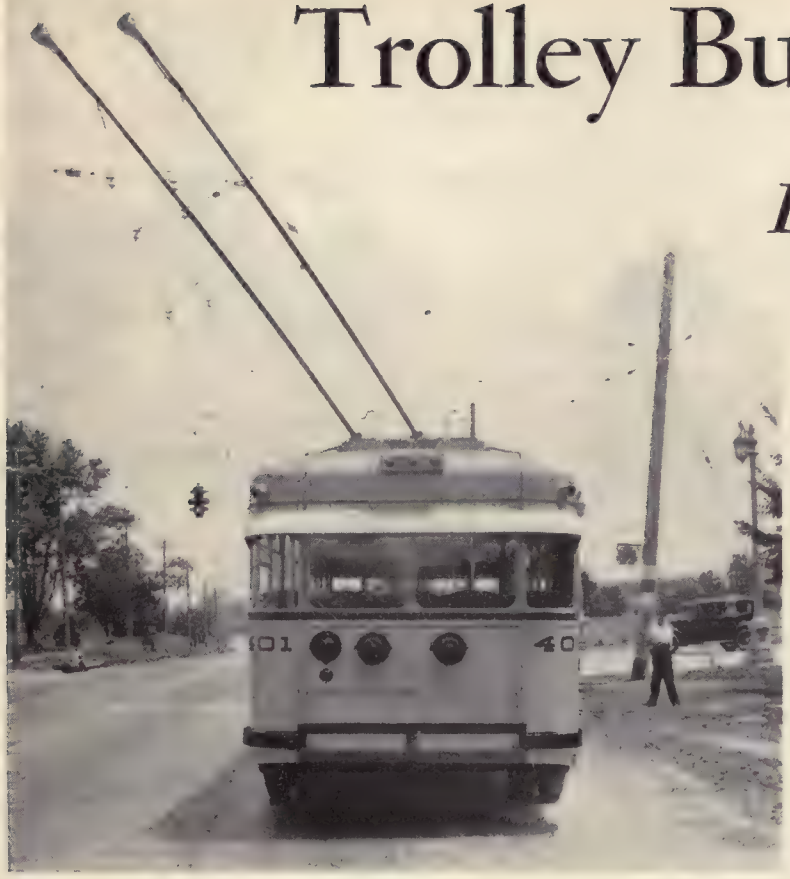
Two transfer forms are used on each route, one for each direction of travel. Both forms have "P.M." coupons on the free end and locality tear-offs at the padded end. On each form the tear-offs are arranged successively in the order in which the localities are traversed, with the starting point tear-off nearest the transfer body. Such arrangement prevents alteration of a transfer after issuance because a shortened transfer allows fewer privileges than one with more tear-off sections attached. The last tear-off on all transfers is marked "Emergency" for issuance when cars are off route, turned back, or in any irregular situation. The transfer is $5\frac{3}{4}$ in. long by 2 in. wide. Printing economies of over $1,500 a month are being realized because of the smallness and simplicity of the transfer.

When a passenger tenders a transfer for fare and desires to ride on another line, the trainman sets a punch mark in the square denoting the direction of his car, and returns the original transfer. This scheme does two things; it keeps the original transfer with the passenger until the end of the journey, thereby indicating to each trainman the origin and general direction or history of the ride, and it places the transfer in each intermediate trainman's hands for inspection.

Trolley Bus Operation

Proves Advantageous at Detroit

High speed, curb loading, comfortable vehicles and quiet operation are factors in building up patronage



Trolley bus on the Plymouth Road line, Detroit. Note the overhead details, the trolley shoes and the wide smooth highway

DECREASED operating costs, increased traffic, improved public relations, and almost entire freedom from accidents are advantages of trolley bus operation on Plymouth Road, Detroit. Both the patrons and the management of the Department of Street Railways are pleased with this new type of service.

Compared with the buses which were formerly used on the line, reductions have been made from 4.80 to 2.02 cents per vehicle-mile for power, from 1.90 to 1.75 cents per vehicle-mile for tires, from 13.04 to 9.25 cents per vehicle-mile for maintenance of equipment, and in total operating cost from 29.21 to 21.95 cents per vehicle-mile.

It is expected that the trolley bus will be subject to comparatively few accidents. In the first four months, nine minor accidents occurred, but seven of these occurred during the first two months when the operators were still unaccustomed to the new type of vehicle.

The route, which is 5.63 miles in length, extends along Plymouth Road from Grand River Boulevard to River Rouge Park. It is located in the northwest section of the city and serves a rapidly growing residential district. Between Grand River and Southfield, a distance of 3.35 miles, the district is well built up. From Southfield to the end of the line, however, there are few houses. For this reason some of the vehicles are turned back at Southfield, to give more frequent service over this section of the line. Most of the traffic on the outer end is to and from River Rouge Park, which has a golf course, swimming pools, tennis courts, and other facilities for recreation. At the park end the buses turn around on a specially constructed loop. At the Grand River end they loop around a triangle which lies between Plymouth and Grand River. Connections are made at this point with the Grand River street car and parlor bus lines, the Oakman car line and the Schoolcraft bus line. At Wyoming Street the route crosses a bus line which gives rush-hour service. One large industrial plant, employing approximately 2,000 men, is located along the route.

In rush hours six-minute service is given on the line. During base hours fifteen-minute headways are maintained to Southfield and 30-minute headways to River Rouge Park.

A cash fare of 10 cents, with free transfers to street car lines, is charged. This is the same as for all bus lines.

Plymouth Road is particularly suitable for trolley bus operation, since it is a smoothly paved wide highway. Because of the condition of the street it is possible to operate at high speed. In June, the trolley buses were operated at a scheduled speed, including layovers, of 12.90 m.p.h. In July this was increased to 13.37, and in August to 14.33. Corresponding speeds for these three months in 1929 when a gasoline bus was being operated were 10.76, 10.26 and 10.46. Operating speed without layovers for the trolley bus in miles per hour is 15.33. This is 1.39 m.p.h. faster than the bus speed.



The Plymouth Road trolley bus line in Detroit extends from Grand River Boulevard to River Rouge Park, a distance of 5.63 miles



It is possible to detour around three lanes of traffic with the trolley buses. This maneuverability permits a high rate of speed

Six Twin Coaches were purchased for the original installation. They are of the 40-passenger type, with leather upholstered seats, treadle exit door and foot control. An interesting device on the vehicle is a switch on the trolley base for lighting a lamp near the operator when the vehicle swings too far from the center line of the overhead. Another noteworthy feature is the use of a reversible trolley shoe. This permits better collection of current at all speeds and practically eliminates overhead noise. Because the vehicle itself is inherently quiet, the use of trolley shoes is considered to be particularly advantageous.

At the present time the six vehicles are being stored and maintained at the Coolidge carhouse. The vehicles are stored in the open, but all inspection and repair work is carried on inside the shop. Plans are now being made for a new garage to care for the vehicles. When it has been built they will be maintained exclusively in this structure. The Coolidge carhouse is approximately 1.2 miles north of Plymouth Road and is reached by overhead allowing two-way operation.

To obtain the best information pertaining to the efficiency of the equipment, as well as schedules, and to note operating conditions in general, it was decided to discard the customary supervisor's and driver's reports because of their inherent insufficiency and to adopt some mechanical means of supervision, not requiring charts which entail a clerical force and clutter up files. After investigating the available instruments, a device known as the Telcam was adopted. A trial installation was made on a coach and later when the trolley buses were ordered, the specifications called for them as regular equipment. No charts are used, the cumulative totals being registered in roller counters, which are noted with each change of driver on a special report form.

The instrument gives the following readings at a glance:

Total Mileage—This counter is at the bottom of the dial and saved the cost of an odometer.

Total Running Time—At the top and extreme right of the instrument's face a counter registers the time in hours and tenths that the bus is actually moving, including all stops up to fifteen seconds' duration. This information will aid in reducing non-revenue time.

Total Overspeeding Time—This register shows how many minutes the bus is run above the speed limit, which for this line has been set for 25 m.p.h.

Number Times Overspeeded—This counter records the number of times the bus was run above the set speed limit. This is called the "abuse factor."

Maximum Speed—A secondary hand on the dial (painted red) is a maximum speed indicator, and is carried forward by the speed pointer, remaining at the maximum speed until reset with a key held at the garage.

A recapitulation is made of information obtained from the daily reports showing the performance records of each bus for the month. A report also is made of each operator's performance. A glance at these gives an accurate check of practically every factor pertaining to the efficiency of the operators and vehicles, as well as the schedules.

Overhead is provided for two-way operation along the full length of the route. Each pair of wires is located so that the vehicles running directly under them will clear a parked lane of cars safely. This permits easy access to the curb and a swinging out to clear a parked lane of cars and two moving lanes. The overhead, which is of the most modern type, was constructed in record time.

Riders Approve New Service

To learn the opinion of the public regarding the trolley bus the department distributed cards among the riders which stated: "We desire to know how we can better serve Detroit with transportation. The trolley bus is our idea of the latest and most superior service. Will you help by expressing your opinion?" Of 170 cards filled in, 167 were favorable to the trolley bus. In addition to many enthusiastic replies, certain of them requested extensions to the existing line, and the installation of new routes in other sections of the city. Among the many reasons given for their preference were: safety in boarding, absence of exhaust fumes, comfortable riding, quietness, convenience of curb loading, cleaner, faster, no gear noise, no dust, dependable, safer, more seating capacity, better ventilation, more flexible, roomy, ability to maintain schedules, restful, free from vibration, faster acceleration and stopping, no jerking, less interference with traffic and nice appearing.

Service was started on Plymouth Road on Saturday afternoon, June 14. The first of the six vehicles carried city officials, headed by Mayor Bowles of Detroit and Mayor Ford of Dearborn. Residents of the neighborhood were invited to ride on the other five buses and to take part in the ceremony. On the way to the park from the Grand River terminal a stop was made in front of the plant of the Kelvinator Corporation, where the employees to be served by the line greeted the officials. They were addressed by Mayor Bowles. At the end of the line several hundred persons gathered for the inaugural program.

Heating Passenger Trains on Electrified Steam Railroads

Practice of American and European roads summarized by N.E.L.A. committee. Both steam and electric heat are used extensively

METHODS of heating trains on electrified sections of railroads in Europe have been investigated by a sub-commitee of the committee on electrification of steam railroads of the National Electric Light Association. Some time ago, members of this committee spent about two months visiting the electrified railroads in England, Holland, Sweden, Germany, Switzerland, Italy and France. It was found that practice differs to some extent in the various countries and with the systems of electrification employed.

Briefly, the several means of heating which have been tried in those countries using single-phase alternating current on the contact lines are:

1. Fuel-fired steam boiler either in the locomotive, a baggage car, or a special heater car.

2. Electrode type of electric steam boiler carried in the locomotive or a baggage car.

3. Resistance type electric steam boiler in the locomotive or the baggage car.

4. Direct heat from transformer on locomotive.

Railroads using low-voltage direct current employ electric heat directly on the motor car trains, but usually heat with steam from coal-fired boilers on main line trains. Where these roads use electric heating, it is customary to have a train line of the same voltage as the contact line. The conclusion of the committee is that on a.c. roads, the present tendencies seem to favor a heating tender and direct heating from the main transformer of the locomotive.

Where electric heating is used on the single-phase roads, present practice indicates the adoption of 800 and 1,000 volts as the standard supply, this voltage being obtained by a special tap on the transformer in the locomotive. Many of the cars used on the main line

Heating Systems Used by Electric Railways in Europe and the United States

	Electrical System					Steam Systems		Electric Systems			
						Boiler		Heaters			
Railroad System	Current	Ph.	Contact Line Volts	Type of Power	Type of Heat	Type	Location	Volts	No. Per Car	Bus Line	Source
England—Suburban lines	D.C.	...	600-1,200	M.U.	Elec.	.....	.....	600-1,200	.....	....	Line
Holland—State railways	A.C.	1	16,000	Loco.	Elec.	.....	.....	600, 800, 1,000	.....	Yes	Main transformer
Germany—Suburban lines	D.C.	...	850	M.U.	Elec.	.....	.....	800	.....	....	Line
Germany—Bavarian and Silesian lines	A.C.	1	16,000	.....	Elec.	.....	.....	800-1,000	.....	Yes	Main transformer
	.....	...	.....	Loco.	Steam	Coal	Heating Tender	.....	.....	....	.....
Sweden	A.C.	1	16,000	Loco.	.....	.....	.....	800-1,000	.....	Yes	Main transformer
Switzerland	A.C.	1	16,000	Loco.	Elec.	.....	.....	800-1,000	.....	Yes	Main transformer
Italy—											
State railways	A.C.	3	3,600	Loco.	Steam	Coal	Tender	.....	.....	....	.....
				Loco.	Steam	Oil	Loco.	.....	.....	....	.....
Nord Milano	D.C.	...	3,000	M.U.	.....	.....	.....	3,000	.....	Yes	Line
France	D.C.	...	650-1,500	M.U.	Elec.	.....	.....	.....	.....	....	Line
				Loco.	Steam	.....	Tender	.....	.....	....	.....
United States—											
Baltimore & Ohio	D.C.	...	650	Loco.	Steam	.....	.....	.....	.....	....	Steam loco. held in train
Staten Island Rapid Transit	D.C.	...	600	M.U.	Elec.	.....	.....	600	Under each seat	....	Line
Butte, Anaconda & Pacific	D.C.	...	2,400	Loco.	Hot air	.....	.....	.....	.....	....	Heat from elec. grids on loco.
New York Central	D.C.	...	600	M.U.	Elec.	.....	.....	600	Under each seat	....	Line
				Loco.	Steam	Oil	Loco.	.....	.....	....	.....
Great Northern	A.C.	1	11,000	Loco.	Steam	Oil	Tender	.....	.....	....	.....
Boston & Maine	A.C.	1	11,000	Loco.	Steam	.....	.....	.....	.....	....	Steam loco. held in train
N. Y., New Haven & Hartford	A.C.	1	11,000	M.U.	Elec.	.....	.....	.....	Under each seat	....	Line
				Loco.	Steam	Oil	Loco.	.....	.....	....	.....
Michigan Central	D.C.	...	600	Loco.	None	.....	.....	.....	.....	....	Not heated in electric zone
Chi., Milwaukee, St. Paul & Pacific	D.C.	...	3,000	Loco.	Steam	Oil	Loco.	.....	.....	....	.....
Pennsylvania	A.C.	1	11,000	M.U.	Elec.	.....	.....	.....	Under each seat	....	Line
	D.C.	...	600	Loco.	None	.....	.....	.....	.....	....	Not heated in electric zone
Norfolk & Western	A.C.	1	11,000	Loco.	Steam	.....	.....	.....	.....	....	Steam loco. held in train
Virginian	A.C.	1	11,000	Loco.	Steam	.....	.....	.....	.....	....	Passenger trains steam oper.
Illinois Central	D.C.	...	1,500	M.U.	Elec.	.....	.....	.....	Under each seat	....	Line
Canadian National (St. Clair tunnel)	A.C.	1	.....	Loco.	None	.....	.....	.....	.....	....	Not heated in electric zone
Delaware, Lackawanna & Western	D.C.	...	3,000	M.U.	Elec.	.....	.....	.....	Under each seat	Yes	Line
Cleveland Union Terminals	D.C.	...	3,000	Loco.	Steam	Oil	Loco.	.....	.....	....	.....
Boston, Revere Beach & Lynn	D.C.	...	600	M.U.	Elec.	.....	.....	.....	Under each seat	....	Line
Reading	A.C.	1	11,000	M.U.	Elec.	.....	.....	.....	Under each seat	....	Line

railroads are equipped for both electric and steam heating.

On European d.c. roads, heating of multiple unit cars is usually at the trolley or third-rail voltage; 600, 1,200 or 1,500 volts. Heating units taking 3,000 volts are in use on the Nord Milano road in Italy.

As to capacity in general, 40 kw. per passenger coach is allowed for heating, or a total of 400 kw. per locomotive, No reference is made by the committee to thermostatic control, and it is assumed that practically all of the equipment inspected was arranged for hand control either by the engineer, trainmen or passengers.

Following is a condensed statement of the practice reported for the several European countries visited:

England—Electric operation is confined to suburban service around a few of the large cities. Heating is done at the contact line voltage, either 600 or 1,200.

Holland—The state railways use 16,000-volt single-phase current. Both locomotives and coaches are heated from individual heating units receiving power from taps on the main locomotive transformer. Voltages for heating are nominally 600, 800 and 1,000. This permits interchange with the cars of the German State Railways, which use 800 and 1,000 volts. A heating bus line runs throughout the train carrying the positive wire and the heaters are grounded.

Germany—The suburban lines around Berlin, which are now being changed to electric traction, use multiple-unit cars supplied from a third rail at 850 volts d.c. The power is used directly for heating the motor cars. On the branch lines in Bavaria and Silesia, the cars are supplied from the 16,000-volt a.c. trolley through special taps on the transformers. On the lines with electric locomotives, in several instances, heating tenders with coal-fire boilers are used. A regular program is under way for installing electric heaters on passenger cars to eliminate the necessity for this auxiliary. On trains supplied with electric heat from the main transformer of the locomotive, a heating bus line with standard jumpers runs the length of the train. In each compartment control switches are installed which may be manipulated by passengers or trainmen. Heating voltages are nominally 800 and 1,000.

Sweden—Locomotive-hauled trains are used on the principal lines that have been electrified. The plan for heating is similar to that mentioned for Germany.

Switzerland—The system used is practically the same as that described for Germany and Sweden. In fact, much of the development work which was done before the adoption of the present practice in those countries was done in Switzerland. It is interesting to note that passenger coaches which are normally hauled by electric locomotives, and which cannot receive heat from them while standing alone in stations, are heated by means of special transformers mounted on portable trucks which can be moved around the station on the running rails. On the Loetschberg line, an experiment was made with steam boilers heated by electricity. When it was learned that the amount of energy required was three times as great as that for direct electric heating, the method was discontinued.

Italy—A majority of the electric trains in Italy are heated by coal-fired boilers carried on separate tenders. An oil-fired boiler is being tried out on one of the three-phase passenger locomotives. On account of the comparatively small requirements for car heating the problem does not apparently receive the attention which it is given in the more northerly countries. On the privately owned Nord Milano line, which has 3,000-volt d.c. multiple-unit cars, a bus line is carried across the car roof, and heating elements using 3,000 volts are arranged in two parallel groups so that the amount of heat can be controlled by the trainmen.

France—Multiple-unit trains in the vicinity of Paris operating from both 650 and 1,500 volts are electrically heated, using power at contact line voltage. On main-line trains hauled by electric locomotives it is customary to use heating tenders.

United States—For comparison with domestic practice, the accompanying table has been compiled from information supplied by the General Electric Company, giving briefly practice of the various railroads in the United States. On only one road where coaches are handled by electric locomotives are they heated electrically. This is on the Butte, Anaconda & Pacific Railway, which uses 2,400-volt hot-air heaters. The roads having multiple-unit motor cars use electric heat, the supply to the heaters being governed by thermostats on each car to maintain uniform temperatures. In the New York Terminal zone of the Pennsylvania Railroad, on the Michigan Central and the Canadian National (St. Clair Tunnel) electrification, no provision is made for heating cars within the electric zone, since the runs are comparatively short and the cars are heated by steam connections at the terminals. On motor cars on the alternating-current lines of the Pennsylvania, heating is from low-voltage taps on the transformer of each car, giving approximately 600 volts. The circuits are hand controlled at the discretion of the trainmen.

Richey Fare Index Revised

COMPILATION of average fares, which is made monthly by Prof. Albert S. Richey and regularly published in ELECTRIC RAILWAY JOURNAL, has just been revised on the basis of the population of the various cities as shown in the 1930 U. S. Census. These average fare figures are based on the cash and ticket fares in effect in all United States cities of more than 50,000 population (except New York City) and are weighted in accordance with the population of the various cities. As previously computed, the total number of cities included was 145; the 1930 census adds 46 cities in the 50,000 class and drops two, so that there are now 189 cities included in computing the average. A study of fares in connection with the revision showed that 102 cities out of the total of 189 (comprising 53 per cent of the total population considered) have average fares of less than 8 cents, and that such cities have shown an increase in population of about 43 per cent since 1920. On the other hand, the 87 cities which have average fares of 8 cents or more include a population of only 47 per cent of the total, and have increased in population only 21 per cent since 1920. The more rapid growth and the larger total population of cities with fares averaging less than 8 cents explains the reduction in the weighted average fare figure from 8.01 cents, as calculated on the 1920 population basis for October, 1930, to 7.79 cents, which is the revised average as calculated on the basis of 1930 population.

The weighted average fare has further been recomputed for the past five years so as properly to join the averages as computed prior to 1926 with the revision on the basis of 1930 population. In such revision of the averages for 1926-1930, inclusive, it has been assumed that the change in population has occurred at a uniform rate during that period. The revised figures are shown in the accompanying table.

Revision of Richey Fare Index to 1930 Population

	1926	1927	1928	1929	1930
January	7.32	7.38	7.50	7.58	7.67
February	7.35	7.40	7.50	7.61	7.69
March	7.35	7.39	7.52	7.61	7.69
April	7.35	7.39	7.52	7.61	7.71
May	7.35	7.39	7.52	7.61	7.76
June	7.36	7.39	7.52	7.61	7.77
July	7.35	7.45	7.53	7.61	7.77
August	7.35	7.45	7.54	7.61	7.78
September	7.35	7.46	7.54	7.61	7.78
October	7.37	7.46	7.54	7.61	7.79
November	7.38	7.48	7.57	7.62	....
December	7.38	7.48	7.58	7.62	...
Average	7.35	7.43	7.53	7.61	..

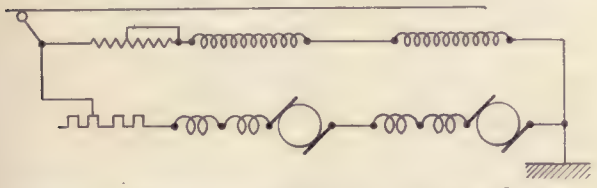
Regenerative Equipment

Planned for Paris Tramcars

Compound-wound motors with simplified control and use of automatic braking save 25 per cent of propulsion energy, besides increasing speed, reducing brake wear and maintenance. Recommendation for rebuilding all modern motors on the system was made as the result of extensive tests on twenty equipments

MODIFICATION of the electrical equipments of all the motor cars of the Société des Transports en Commun de la Région Parisienne, the government-controlled company that operates all transport facilities in Paris and vicinity, is contemplated by the management. It is proposed to change over the equipments on all of the cars having modern motors with commutating poles and capable of being converted into compound motors, the total motors involved being 2,350. A recommendation also has been made to the Department of the Seine, the governmental agency controlling the system, to retire 695 cars equipped with old-style motors and replace them with modern cars equipped with compound motors.

This information was made public at a special meeting of the Union Internationale de Tramways, de Chemins



Schematic diagram of control for two compound motors as developed in Paris

de Fer d'Intérét Local et de Transports Publics Automobiles (International Tramway and Bus Association), held on Oct. 21-22 at Paris for the purpose of inspecting the new type of equipments. L. Bacqueyrisse, general manager of operation and technical service of the system, made the announcement at the close of a paper in which he explained details of the new method. He stated that the results of the tests, which have been conducted on twenty cars in regular service following extended investigation, have shown that the new equipments have numerous advantages as compared with ordinary equipments of series motors with series-parallel control.

The advantages are summarized as follows:

1. Reduction in cost of energy, averaging 25 per cent, resulting from (a) lower rheostatic losses at starting; (b) economical running at low constant speeds; (c) regeneration of energy on down grades and when reducing speed, as at stops; (d) ease of operation and lessened influence of the personal element of the motorman.

2. Reduction of maintenance expense resulting from the easy progression in starting and stopping, with elimination of jerks, and the lessened wear on the braking system and the wheel treads.

3. Increase in the schedule speed.

4. Electric braking.

5. Low cost of the electrical equipment, due to its simplicity and its low weight and reduced complication.

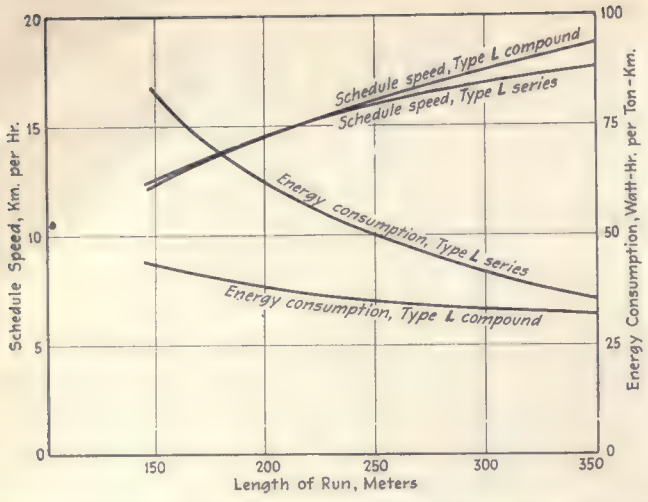
The tests, which were made in Paris during the past two years, were intended to prove whether a material saving could be shown from the specific consumption of the latest lightweight cars (Type L) used in Paris. These cars, equipped with series motors with series-parallel control, are of the single-truck type with differential axles and worm drive. The specific consumption, due to various improvements, is 43.2 watt-hours per ton-kilometer (63 watt-hours per ton-mile).

Since regenerative equipments proposed in the past seemed to present too many complications, the Paris engineers decided that a material simplification would be necessary, and adopted compound motors with simplified control. It was felt that, to be successful, the equipments should be suitable for lines of varying profile, under conditions of traffic congestion and with short distances between stops, and that acceleration and braking rates should be sufficiently high to give acceptable schedule speeds, all with no greater complication for the operator than with ordinary equipments. According to Mr. Bacqueyrisse, these requirements have all been realized.

Existing Equipment Was Rebuilt

In order to have a satisfactory equipment for regeneration, it was found that the characteristics should permit a wide speed range. This requires satisfactory commutation with the field unsaturated, necessitating a high ratio of field ampere turns to armature ampere turns, a large air gap, pole pieces of appropriate form, and a large number of commutator bars. Two motors were selected for the tests, TH-523 and TH-563, both constructed by the French Thomson-Houston Company. On account of the low continuous rating of the TH-523 motor (25 hp.), both field and armature windings were modified. The TH-563, designed for rheostatic braking and rated at 36 hp., required a change in the field windings only. The commutating fields were not disturbed in either motor.

The number of series field turns was reduced materially and shunt field windings were added. The arma-



Range of schedule speed and energy consumption, compound and series motor equipments

tures of the TH-523 motors were rewound with square wire instead of round wire, thus increasing the rating 27 per cent. The weights of the motors have not been changed to any considerable extent. Stand tests have shown that the motors develop equal or greater power. For the input corresponding to the balancing car resistance, the motors have a maximum speed range of 5 to 1 with various values of shunt field current. At this portion of the curve the efficiency is in the neighborhood of 88 per cent, which is the maximum for the series motor, while at maximum load the efficiency is 84 per cent.

The schematic connection diagram shows that the armatures, the series fields, the commutating fields and a starting resistance are all connected in series across the line. The shunt fields are connected in series with a regulating rheostat in the circuit. Starting is accomplished with full shunt field on the motors by cutting out the two steps of series armature resistance. Beyond this point increases in speed are made by weakening the shunt field by inserting resistance.

Reduction of shunt field resistance causes the armature to generate an electromotive force greater than that of the line, so that the armature generates current which is returned to the system. This return of energy evidently is accompanied by a reduction of speed as the kinetic energy is converted into electrical energy. A similar effect is produced when the car goes down a grade steep enough to more than overcome the car resistance.

The speed variation of 5 to 1, which corresponds, with the gear ratio adopted, to a range in car speed between 6 and 30 km.p.h. (3.7 and 18.6 m.p.h.), which keeps within the speed permitted by the authorities, permits elimination of the series-parallel transition and simplification of the control.

While the armatures might be connected in series or in parallel, it has been found advantageous to connect them in series to obtain equal division of load and reduce the voltage between commutator bars.

Regeneration of energy, effected by strengthening the shunt field, is readily carried down to about 8 km. p.h. (5 m.p.h.). At this point, only about 7 per cent of the energy in the car at 30 km.p.h. (18.6 m.p.h.) remains in the car. While it might be possible to regenerate down to very low speeds, the value of that procedure is questionable. It requires mechanisms that are heavy, complicated, and difficult to control, according to Mr. Bacqueyrisse.

Besides regeneration, a number of other important advantages are obtained. With the fields completely saturated, the minimum speed on full armature voltage is reduced, so that the series resistances and the rheostatic loss are much less than with series motors. For the same reason, low constant speeds can be obtained, which are useful for slow running on a congested street behind a line of traffic. The comfort of the passengers and wear and tear on the equipment are lessened by elimination of the large number of series resistance points and of the series-parallel transition. Also, with smoother starting and stopping, higher rates of acceleration and braking are feasible.

Elimination of coasting permits an increase in the average speed of the run along with lower energy consumption, as the energy is regenerated during the retardation period. This gain in speed is considered important under present-day conditions.

Braking, like starting, is obtained at high rates due to successive reductions in the shunt field resistance. Below 8 km.p.h. there are two steps of dynamic braking, which bring the car to standstill. On account of the shunt field it is not necessary to reverse the armatures, and the series fields are short-circuited to prevent any differential action. Air brakes are unnecessary, and there is a marked reduction in the cost of maintenance of brake shoes, wheels and brake rigging.

Control Equipment Simplified

The controller and wiring, shown diagrammatically, indicate the simplification of the connections. There is a main controller drum with ten running points, two rheostatic braking points and one off point; a reverser cylinder with five positions, two for forward and reverse movement, two for emergency braking only by short-circuiting the motors, and one off position; an interlock between the main drum and the reverser; a device for shunting the series fields, which permits variation of the ratio of series ampere turns to shunt ampere turns, on which depends the rate of regeneration and the stability of action. On the neutral position of the reverser, all circuits are dead; but on the off position of the main drum, a small current flows through the shunt field circuit so that surges from opening it at every stop are avoided. A voltage relay inserts a resistance in the shunt field circuit so as to limit the electromotive force generated to 675 volts in the event of the failure of power supply or a dewirement

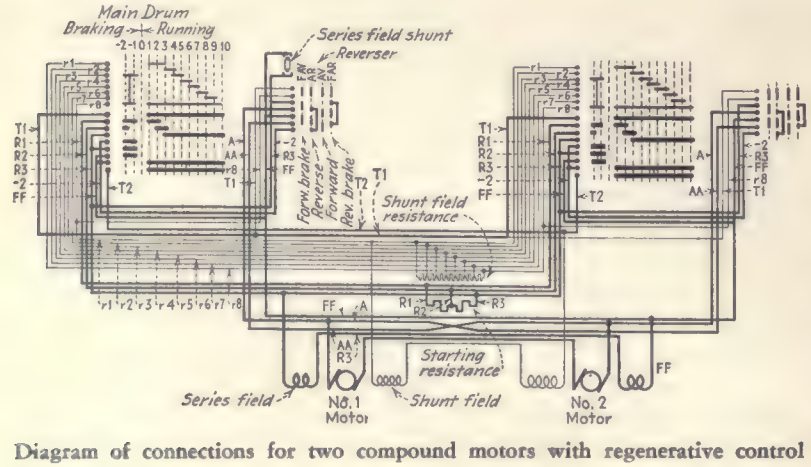
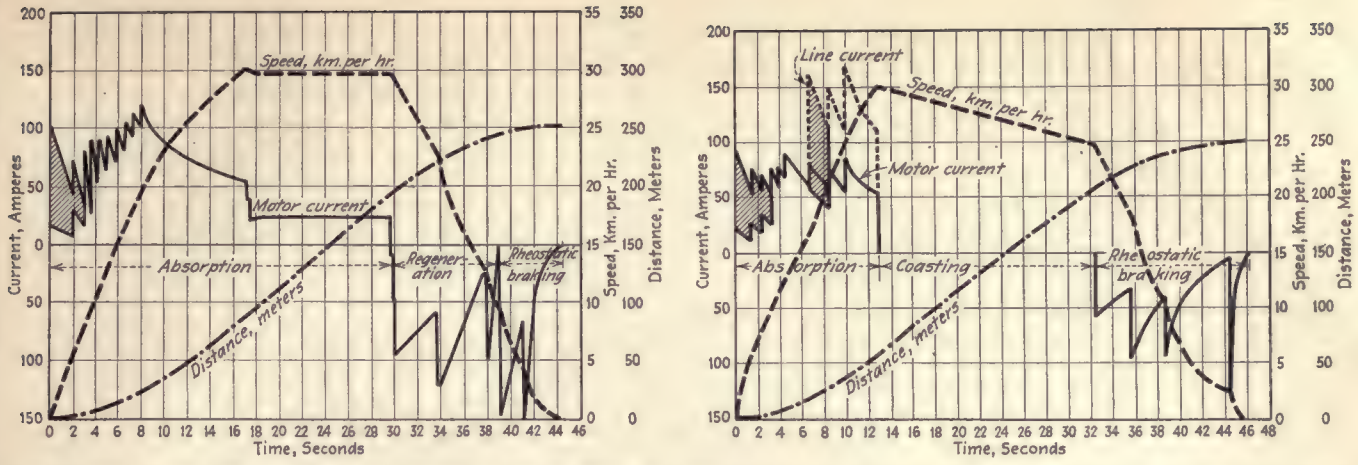


Diagram of connections for two compound motors with regenerative control



Comparative curves for a run of 250 meters. Results with compound motors at left and with series motors at right. Comparative figures are shown below

	Compound Motors	Series Motors
Time of run, seconds	44.9	46.4
Maximum speed, km.p.h.	30	30
Schedule speed, km.p.h. (10 seconds stop)	16.47	15.95
Energy absorbed from line, kw.	244	202.5
Energy regenerated	99.5	0
Energy taken, net	144.5	202.5
Energy used, watt-hours per ton-kilometer	35.4	49.7
Energy lost in resistance, watt-hours	28.6	50.2
Energy lost in resistance, per cent of input	11.5	24.8

of the trolley. There also are the usual cutout switches for use if one motor is disabled.

As may be seen, the wiring is greatly simplified. The total length of the power cables is reduced from 333 m. to 136 m. (1,100 ft. to 450 ft.), while the shunt excitation wiring is only 136 m. (450 ft.) of small wire.

Due to the reduction of weight of starting resistances, wiring, controllers, and series field shunting resistances, the weight of the car for regeneration is about 400 kg. (880 lb.) less than for an exactly similar car equipped with series motors.

Tests Show Material Savings

Tests were carried on with the first motor car changed over for more than 7,000 km. (4,300 miles) on the line between Porte de St. Cloud and Versailles. It was found that for the motor car alone the energy recuperated was 31 per cent of that taken from the line. On the up-grade trip the recovery was 18.5 per cent, while on the down-grade trip it was 59.5. The net saving compared with a car of exactly similar type under the same conditions of test, but fitted with series motors and series-parallel control, was 24 per cent. The specific consumptions of the two cars were 38.4 watt-hours per ton-kilometer (56 watt-hours per ton-mile) for the regenerative equipment and 50 watt-hours per ton-kilometer (73 watt-hours per ton-mile) with series motor equipment. The latter exceeds the average consumption for the system on account of the operating conditions imposed for the test.

Results obtained in normal passenger service have fully borne out the test predictions. It was found that a great advantage is the ability to run at any one of a number of constant speeds. This makes it possible to follow any traffic closely without successive applications of power and consequent jerking.

Energy consumption on the Louvre-Versailles line, which has a broken profile, showed a net saving of 27 per cent for the compound motor equipments hauling trailers, as compared with similar trains equipped with series motors. On Line 25, practically level throughout, but with heavy traffic congestion, Type G motor cars without trailers showed an energy saving of 23.8 per cent as compared with similar series motor equipments.

An important result found was that while there is considerable variation from the mean energy consumption with series motor equipments due to the personal element of the motorman, the individual runs with compound motor equipments ran much closer to the average.

The two speed-time curves reproduced indicate the results with the two types of equipment for a run of 250 meters, the limiting speed being 30 km.p.h. for each. The hatched areas represent the loss in starting resistance, which is 11.5 per cent for the compound motors and 24.8 per cent for the series motors. The net energy consumption per ton-kilometer was respectively 35.45 watt-hours for the compound motor equipment and 49.75 watt-hours per ton-kilometer for the series motor equipment. The schedule speeds are respectively 16.47 km.p.h. (10.21 m.p.h.) and 15.95 km.p.h. (9.89 m.p.h.), showing a gain of 3.3 per cent for the compound motor equipment.

Another study was made without the speed limitation of 30 km. The maximum speed attained in making the run of 250 km. was 35.5 km. (22.01 m.p.h.). The energy consumed was 26.68 watt-hours per ton-kilometer (43.1 watt-hours per ton-mile) for the compound motor equipment against 67.80 watt-hours per ton-kilometer (109 watt-hours per ton-mile) for the series motor equipment, the saving being 57.8 per cent. The ratio of energy regenerated to energy absorbed was 55.5 per cent.

It was pointed out by Mr. Bacqueyrisse that, contrary to the opinion frequently expressed, the compound motor behaves well with variations in line voltage. The compound motors are in use on a route which includes a section of underground conduit on which there are frequent breaks of the conductor rails with reversals of polarity.

It also was pointed out that the results were obtained with motors which were constructed from standard series motors with a minimum of modification. Motors designed specially for service undoubtedly would show better results. The series motors with which the new equipments were compared represented the latest designs of the manufacturers.

Studies made in Paris indicate that the cost of changing the equipments will be amortized in 6¾ years on account of the economies. It also was stated that the use of compound motors should be of even greater advantage on rapid transit lines.

Monthly and Other Financial Reports

	Operating Revenue $	Operating Expenses $	Taxes $	Gross Income $	Net Income $
San Diego Electric Railway, San Diego, Cal.					
September, 1930.....	124,805	105,491	9,451	21,480	*9,835*
September, 1929.....	133,066	107,685	9,818	25,918	*4,278*
9 mo. end. Sept., 1930.	1,190,671	1,010,972	87,864	192,773	*88,650*
9 mo. end. Sept., 1929.	1,215,071	1,007,805	89,126	208,856	*63,392*
San Diego Electric Railway, San Diego, Cal.					
October, 1930.....	126,158	118,289*a*		7,869	*14,559*
October, 1929.....	136,394	121,840*a*		14,554	*6,067*
12 mo. end. Oct., 1930.	1,316,829	1,217,125*a*		99,704	*103,210*
12 mo. end. Oct., 1929.	1,351,466	1,218,771*a*		132,695	*69,460*
Market Street Railway, San Francisco, Cal.					
October, 1930.....	786,012	675,908*a*		110,104	57,384
October, 1929.....	843,134	680,318*a*		162,816	105,444
12 mo. end. Oct., 1930.	9,308,522	6,899,998*a*		1,408,524	745,252
12 mo. end. Oct., 1929.	9,568,360	8,110,157*a*		1,458,203	714,225
Northwestern Pacific Railroad, Sausalito, Cal.					
September, 1930.....	548,282	435,809	35,848	76,617	16,471*g*
September, 1929.....	599,699	453,698	36,539	109,436	100,287*g*
9 mo. end. Sept., 1930.	4,354,154	3,760,439	324,119	269,251	196,523*g*
9 mo. end. Sept., 1929.	4,649,603	3,997,698	339,035	312,508	279,612*g*
Denver Tramway Corporation, Denver, Col.					
9 mo. end. Sept., 1930.	2,987,628	2,062,237	365,164	594,594	220,145
9 mo. end. Sept., 1929.	3,141,662	2,148,576	370,836	657,995	271,841
9 mo. end. Sept., 1928.	3,204,631	2,104,581	379,845	747,041	377,512
9 mo. end. Sept., 1927.	3,272,495	1,819,947	383,595	1,101,710	734,815
Capital Traction Co., Washington, D. C. (Revised)					
September, 1930.....	327,713	243,059	25,007	60,389	30,259
September, 1929.....	330,038	247,256	25,205	58,534	28,342
9 mo. end. Sept., 1930.	3,073,934	2,260,967	233,635	595,428	320,390
9 mo. end. Sept., 1929.	3,194,057	2,295,305	245,880	671,437	396,899
Capital Traction Co., Washington, D. C.					
October, 1930.....	374,646	256,781	31,570	86,287	58,638
October, 1929.....	370,108	263,356	29,329	77,423	49,881
10 mo. end. Oct., 1930.	3,448,581	2,517,748	265,214	665,618	379,028
10 mo. end. Oct., 1929.	3,564,166	2,558,662	275,210	730,293	446,781
Jacksonville Traction Co., Jacksonville, Fla.					
September, 1930.....	78,529	69,098	5,914	3,199	.....
September, 1929.....	86,811	75,242	9,195	1,975	.....
12 mo. end. Sept., 1930	1,006,294	870,254	102,718	87,151	*66,335*
12 mo. end. Sept., 1929	1,156,423	945,703	107,646	96,730	*61,336*
Honolulu Rapid Transit Co., Honolulu, Hawaii					
September, 1930.....	83,394	50,641	9,149	24,748	12,429
September, 1929.....	86,253	49,266	7,843	30,398	19,174
9 mo. end. Sept., 1930.	777,205	458,684	80,604	249,102	143,520
9 mo. end. Sept., 1929.	790,028	452,433	82,079	265,442	164,388
Chicago Surface Lines (Corrected)					
September, 1930.....	4,568,564	3,789,472*a*		779,092	713,323*b*
September, 1929.....	5,048,005	4,011,031*a*		1,036,973	819,277*b*
Chicago Surface Lines, Chicago, Ill.					
October, 1930.....	4,879,570	3,933,416*a*		446,153	799,118*b*
October, 1929.....	5,469,617	4,244,885*a*		1,224,731	916,198*b*
United Railways & Electric Co., Baltimore, Md.					
September, 1930.....	1,261,734	.....	.....	.....	10,050
September, 1929.....	1,352,582	.....	.....	.....	41,549
9 mo. end. Sept., 1930.	12,192,062	.....	.....	.....	329,610
9 mo. end. Sept., 1929.	12,378,256	.....	.....	.....	294,410
United Railways & Electric Co., Baltimore, Md.					
October, 1930.....	1,354,086	908,575	140,731	314,726	25,163
October, 1929.....	1,460,077	962,111	140,656	371,860	87,260
10 mo. end. Oct., 1930.	13,546,148	9,272,611	1,292,968	2,269,574	354,773
10 mo. end. Oct., 1929.	13,838,333	9,443,190	1,340,756	2,355,616	381,670
Boston Elevated Railway, Boston, Mass.					
September, 1930.....	2,470,918	1,948,236	143,482	384,345	*316,296*
September, 1929.....	2,568,068	1,950,523	130,327	492,721	*197,825*
3 mo. end. Sept., 1930.	7,122,393	5,871,539	441,445	835,021	*1,272,087*
3 mo. end. Sept., 1929.	7,538,121	5,941,713	380,922	1,237,844	*845,378*
9 mo. end. Sept., 1930.	24,164,768	17,576,058	1,236,277	5,436,424	*893,527*
9 mo. end. Sept., 1929.	25,095,812	17,963,601	1,243,875	5,953,226	*321,767*
Boston, Revere Beach & Lynn R.R., Boston, Mass.					
3 mo. end. Sept., 1930.	366,517	270,579	9,000	87,542	51,873
3 mo. end. Sept., 1929.	384,692	266,875	10,077	108,662	72,006
9 mo. end. Sept., 1930.	967,478	768,568	27,000	173,634	66,323
9 mo. end. Sept., 1929.	985,149	748,801	30,076	208,235	97,801
Eastern Massachusetts Street Railway, Boston, Mass.					
September, 1930.....	612,237	421,570	26,900	175,174	21,771
September, 1929.....	659,140	412,023	32,552	232,698	74,466
9 mo. end. Sept., 1930.	5,943,714	3,839,296	261,442	1,935,281	400,013
9 mo. end. Sept., 1929.	6,472,825	4,045,689	291,685	2,302,285	716,216
Eastern Massachusetts Street Railway, Boston, Mass.					
October, 1930.....	623,872	440,793	26,980	167,101	15,811
October, 1929.....	681,561	465,240	26,731	215,385	67,947
10 mo. end. Oct., 1930.	6,567,586	4,280,090	288,422	2,102,387	415,824
10 mo. end. Oct., 1929.	7,154,387	4,510,930	318,416	2,517,670	784,163
Fitchburg & Leominster Street Ry., Fitchburg, Mass.					
3 mo. end. Sept., 1930.	66,806	56,388*a*		10,418	2,347
3 mo. end. Sept., 1929.	82,586	62,183*a*		20,403	12,025
9 mo. end. Sept., 1930.	219,329	170,568*a*		48,761	31,780
9 mo. end. Sept., 1929.	256,565	188,612*a*		69,953	52,027

	Operating Revenue $	Operating Expenses $	Taxes $	Gross Income $	Net Income $
Boston, Worcester & New York Street Ry., Framingham, Mass.					
3 mo. end. Sept., 1930.	244,728	216,288	4,875	23,985	10,125
3 mo. end. Sept., 1929.	213,828	177,546	5,149	40,863	27,003
9 mo. end. Sept., 1930.	595,904	538,984	14,625	44,344	2,764
9 mo. end. Sept., 1929.	557,455	189,125	14,899	64,287	22,717
Holyoke Street Railway, Holyoke, Mass.					
3 mo. end. Sept., 1930.	124,968	117,617*a*		13,024	*7,583*
3 mo. end. Sept., 1929.	160,897	123,393*a*		43,846	23,165
9 mo. end. Sept., 1930.	440,179	408,921*a*		47,722	*13,785*
9 mo. end. Sept., 1929.	534,785	458,613*a*		93,660	31,540
Union Street Railway, New Bedford, Mass.					
3 mo. end. Sept., 1930.	273,426	254,258	14,770	4,398	*869*
3 mo. end. Sept., 1929.	339,280	280,753	14,833	43,694	39,483
9 mo. end. Sept., 1930.	851,963	790,701	44,402	16,860	105
9 mo. end. Sept., 1929.	972,812	837,576	43,877	91,359	80,276
Middesex & Boston Street Railway, Newtonville, Mass.					
3 mo. end. Sept., 1930.	242,378	220,058*a*		22,320	*12,092*
3 mo. end. Sept., 1929.	260,095	239,424*a*		20,671	*18,363*
9 mo. end. Sept., 1930.	842,891	701,053*a*		141,838	30,648
9 mo. end. Sept., 1929.	859,897	748,718*a*		111,179	*5,659*
Berkshire Street Railway, Pittsfield, Mass.					
3 mo. end. Sept., 1930.	144,178	136,112	6,540	1,526	*70,319*
3 mo. end. Sept., 1929.	163,747	146,186	5,087	12,474	*60,811*
9 mo. end. Sept., 1930.	501,772	415,489	17,524	68,759	*146,937*
9 mo. end. Sept., 1929.	537,564	444,300	16,660	76,604	*143,889*
Springfield Street Railway, Springfield, Mass.					
3 mo. end. Sept., 1930.	537,573	461,704	8,529	68,488	*1,190*
3 mo. end. Sept., 1929.	626,595	531,340	8,874	88,549	15,687
9 mo. end. Sept., 1930.	1,831,930	1,460,594	26,888	348,602	137,786
9 mo. end. Sept., 1929.	2,037,851	1,651,619	29,258	363,465	144,820
Worcester Consolidated Street Railway, Worcester, Mass.					
3 mo. end. Sept., 1930.	622,472	499,582	14,001	111,917	9,142
3 mo. end. Sept., 1929.	708,871	598,637	15,871	100,390	*18,118*
9 mo. end. Sept., 1930.	2,123,978	1,587,282	51,778	493,638	181,429
9 mo. end. Sept., 1929.	2,290,248	1,767,798	60,282	380,019	134,805
Department of Street Railways, Detroit, Mich.					
September, 1930.....	1,510,161	1,372,715	63,460	92,357	*51,711*
September, 1929.....	2,049,235	1,580,632	62,327	415,660	270,798
12 mo. end. Sept., 1930	22,594,711	18,736,157	771,714	3,216,793	1,490,094
12 mo. end. Sept., 1929	26,715,667	21,169,937	750,968	4,947,077	3,253,351
Department of Street Railways, Detroit, Mich.					
October, 1930.....	1,579,476	1,394,777	63,461	125,350	22,933
October, 1929.....	2,129,774	1,652,130	61,936	425,792	276,683
12 mo. end. Oct., 1930...	22,044,413	18,478,804	773,239	2,916,351	1,190,479
12 mo. end. Oct., 1929...	26,684,738	21,145,235	749,469	4,927,723	3,251,132
Twin City Rapid Transit Co., Minneapolis, Minn.					
3 mo. end. Sept., 1930.	2,731,434	2,213,720	.....	517,714	*48,623*
3 mo. end. Sept., 1929.	3,042,990	2,423,575	.....	619,414	38,008
9 mo. end. Sept., 1930.	9,330,401	6,979,728	.....	2,350,673	596,403
9 mo. end. Sept., 1929.	10,056,521	7,509,913	.....	2,546,607	724,932
Kansas City Public Service Co., Kansas City, Mo.					
September, 1930.....	650,114	482,649	41,675	125,788	50,261
September, 1929.....	722,167	596,603*a*		125,563	50,936
9 mo. end. Sept., 1930.	6,187,103	4,830,712	375,075	981,315	278,663
9 mo. end. Sept., 1929.	6,672,155	5,423,974*a*		1,248,181	547,416
Illinois Terminal Company, St. Louis, Mo.					
September, 1930.....	654,477	420,703	34,115	199,646	160,897*g*
September, 1929.....	690,722	481,979	23,349	185,394	140,341*g*
9 mo. end. Sept., 1930.	5,679,166	3,935,379	268,680	1,474,987	1,093,870*g*
9 mo. end. Sept., 1929.	6,165,591	4,282,384	211,046	1,672,034	1,246,554*g*
Omaha & Council Bluffs Street Ry., Omaha, Neb.					
September, 1930.....	227,147	151,009	32,950	43,188	1,780
September, 1929.....	210,319	159,722	29,347	21,250	*19,377*
International Railway, Buffalo, N. Y.					
9 mo. end. Sept., 1930.	7,489,380	6,376,201*a*		1,190,577	244,016
9 mo. end. Sept., 1929.	8,333,955	6,845,033*a*		1,558,991	587,567
Fonda Johnstown & Gloversville R.R., Gloversville, N. Y.					
September, 1930.....	72,267	58,749	4,800	21,874	*8,497*
September, 1929.....	81,673	59,354	7,840	29,068	*1,585*
9 mo. end. Sept., 1930.	682,484	553,470	43,200	161,427	*117,788*
9 mo. end. Sept., 1929.	754,581	571,060	70,560	217,960	*68,894*
Brooklyn-Manhattan Transit Corporation, New York, N. Y. (*h*)					
October, 1930.....	5,036,775	3,250,290	322,263	1,525,903	758,817
October, 1929.....	5,170,393	3,390,008	339,676	1,509,042	738,262
4 mo. end. Oct., 1930..	19,612,226	12,870,348	1,323,218	5,693,867	2,611,586
4 mo. end. Oct., 1929..	20,223,779	13,676,546	1,322,535	5,500,031	2,378,872
Brooklyn & Queens Transit System, New York, N. Y.					
October, 1930.....	1,922,388	1,504,462	92,704	338,881	214,924
October, 1929.....	2,027,618	1,567,260	123,076	358,486	232,939
4 mo. end. Oct., 1930..	7,554,244	5,932,597	427,989	1,250,523	752,950
4 mo. end. Oct., 1929..	8,003,595	6,325,119	467,215	1,296,394	797,039
Hudson & Manhattan R.R., New York, N. Y.					
October, 1930.....	1,033,584	521,325*a*		512,259	176,999
October, 1929.....	1,081,539	531,801*a*		549,738	215,297
10 mo. end. Oct., 1930.	10,149,014	5,136,027*a*		5,012,987	1,662,893
10 mo. end. Oct., 1929.	10,346,171	5,230,051*a*		5,116,120	1,759,302

	Operating Revenue $	Operating Expenses $	Taxes $	Gross Income $	Net Income $
Interborough Rapid Transit Co., New York, N. Y.					
September, 1930	5,684,267	3,783,327	200,041	1,700,898	100,600*e*
September, 1929	5,674,364	3,497,917	198,552	1,977,895	355,407*e*
3 mo. end. Sept., 1930.	16,249,981	11,587,292	596,144	4,066,544	*720,722e*
3 mo. end. Sept., 1929.	16,573,468	11,000,135	597,574	4,975,758	238,625*e*
Interborough Rapid Transit Co., New York, N. Y.					
October, 1930	6,315,679	3,960,101	202,559	2,153,017	161,417*k*
October, 1929	6,387,991	3,995,255	202,126	2,190,638	*150,664k*
4 mo. end. Oct., 1930	22,565,660	15,547,394	798,704	6,219,562	*1,254,917k*
4 mo. end. Oct., 1929	22,961,459	14,995,361	799,700	7,166,397	*607,651k*
Long Island Railroad, New York, N. Y.					
September, 1930	3,589,671	2,059,404	407,652	1,121,855	928,655*g*
September, 1929	3,783,730	2,240,102	376,383	1,166,275	994,058*g*
9 mo. end. Sept., 1930.	30,365,004	19,910,756	2,549.408	7,898,588	6,459,733*g*
9 mo. end. Sept., 1929.	31,552,785	20,420,266	2,353,853	8,762,877	7,330,442*g*
New York Railways Corporation, New York, N. Y.					
September, 1930	489,649	415,904*a*	.....	73,745	34,367*f*
September, 1929	535,117	453,486*a*	.....	81,631	20,554*f*
9 mo. end. Sept., 1930.	4,164,521	3,743,317*a*	.....	421,204	58,952*f*
9 mo. end. Sept., 1929.	4,696,094	4,110,345*a*	.....	585,749	38,244*f*
New York, Westchester & Boston R.R., New York, N. Y.					
September, 1930	203,617	138,756	26,500	38,949	*192,861*
September, 1929	221,654	130,829	24,249	69,469	*148,893*
9 mo. end. Sept., 1930.	1,908,521	1,093,609	230,059	592,452	*1,481,193*
9 mo. end. Sept., 1929.	1,892,809	1,148,211	201,856	551,519	*1,386,275*
Staten Island Rapid Transit Co., New York, N. Y.					
September, 1930	206,908	148,525	17,000	41,383	26,127
September, 1929	246,192	156,008	18,000	72,184	66,529
9 mo. end. Sept., 1930.	1,886,202	1,392,793	154,509	337,392	251,624
9 mo. end. Sept., 1929.	1,995,299	1,492,936	158,800	343,546	288,108
Third Avenue Railway System, New York, N. Y.					
September, 1930	1,428,136	1,072,978	94,550	285,176	45,636
September, 1929	1,479,475	1,194,193	96,882	215,111	*25,651*
3 mo. end. Sept., 1930.	4,207,931	3,277,815	282,879	719,749	1,163
3 mo. end. Sept., 1929.	4,421,944	3,612,769	289,031	595,501	*123,071*
Third Avenue Railway System, New York, N. Y.					
October, 1930	1,456,688	1,107,713	97,742	275,552	36,257
October, 1929	1,517,873	1,222,675	98,794	222,316	16,704
4 mo. end. Oct., 1930	5,664,620	4,385,529	380,622	995,301	37,421
4 mo. end. Oct., 1929	5,939,818	4,835,446	387,825	817,818	139,775
Cincinnati Street Ry., Cincinnati, Ohio					
September, 1930	644,206	436,728	57,867	161,332	*24,702c*
Philadelphia & Western Ry., Norristown, Pa.					
September, 1930	55,413	.....	.....	.....	8,901
September, 1929	65,444	.....	.....	.....	13,851
9 mo. end. Sept., 1930.	506,200	.....	.....	.....	46,777
9 mo. end. Sept., 1929.	586,239	.....	.....	.....	103,699
Philadelphia Rapid Transit System, Philadelphia, Pa.					
3 mo. end. Sept., 1930.	11,611,770	9,123,677*a*	.....	2,703,442	*945,553j*
3 mo. end. Sept., 1929.	12,733,299	9,671,473*a*	.....	3,380,867	*432,588j*
9 mo. end. Sept., 1930.	38,866,294	29,643,722*a*	.....	9,874,368	*1,103,534j*
9 mo. end. Sept., 1929.	41,174,435	31,217,949*a*	.....	10,917,049	*542,381j*
York Railways, York, Pa.					
3 mo. end. Sept., 1930.	648,877	390,478*a*	.....	258,399	183,159
3 mo. end. Sept., 1929.	626,140	377,139*a*	.....	249,001	173,243
12 mo. end. Sept., 1930	2,953,469	1,687,112*a*	.....	1,266,357	949,589
12 mo. end. Sept., 1929	2,795,190	1,555,553*a*	.....	1,239,637	946,514
United Electric Railways, Providence, R. I.					
September, 1930	493,296	434,036*a*	.....	59,260	8,376
September, 1929	565,164	484,253*a*	.....	80,911	29,971
9 mo. end. Sept., 1930.	4,875,804	3,576,297*a*	.....	1,299,507	51,768
9 mo. end. Sept., 1929.	5,368,202	3,805,230*a*	.....	1,562,972	316,682
Texas Electric Railway, Dallas, Texas					
3 mo. end. Sept., 1930.	1,215,160	822,201*a*	.....	392,959	33,049
3 mo. end. Sept., 1929.	1,334,560	856,992*a*	.....	477,568	112,107
Galveston-Houston Electric Ry., Houston, Texas					
August, 1930	47,425	.....	.....	19,021	.....
August, 1929	58,563	.....	.....	22,652	.....
12 mo. end. Aug., 1930	529,519	308,932	32,524	188,256	*82,135d*
12 mo. end. Aug., 1929	605,660	336,470	31,849	237,340	*33,950d*
Galveston-Houston Electric Ry., Houston, Texas					
September, 1930	42,823	25,750	2,302	14,770	.....
September, 1929	51,275	30,974	2,720	17,580	.....
12 mo. end. Sept., 1930.	521,067	303,706	32,106	185,273	84,893
12 mo. end. Sept., 1929.	604,191	337,023	31,638	235,702	34,731
Edmonton Radial Railway, Edmonton, Alta.					
9 mo. end. Sept., 1930.	604,032	408,669	.....	195,363	*6,842*
9 mo. end. Sept., 1929.	.....	.....	.....	.....	7,400
Houston Electric Co., Houston, Texas					
September, 1930	251,919	154,195	21,710	76,012	.....
September, 1929	276,779	169,482	26,887	80,409	.....
12 mo. end. Sept., 1930	3,170,217	1,994,406	245,279	946,051	571,857
12 mo. end. Sept., 1929	3,388,716	2,091,045	291,868	1,009,668	607,277
British Columbia Electric Railway, Vancouver, B. C.					
September, 1930	1,206,579	618,594*a*	.....	587,985	.....
September, 1929	1,169,278	637,436*a*	.....	531,842	.....
3 mo. end. Sept., 1930.	3,597,208	1,904,515*a*	.....	1,692,693	.....
3 mo. end. Sept., 1929.	3,494,752	1,919,200*a*	.....	1,575,552	.....
Guelph Radial Railway, Guelph, Ont.					
10 mo. end. Aug., 1930	73,019	68,248	854	3,917	*26,929*
10 mo. end. Aug., 1929	.....	.....	.....	.....	*26,132*
Ontario Hydro Electric Railways, Essex District, Windsor, Ont.					
10 mo. end. Aug., 1930	883,799	750,490	4,948	128,361	*98,949*
10 mo. end. Aug., 1929	.....	.....	.....	.....	43,245
Havana Electric Railway, Havana, Cuba					
3 mo. end. Sept., 1930.	1,324,517	1,111,696*a*	.....	216,603	59,455*d*
3 mo. end. Sept., 1929.	1,388,840	1,156,789*a*	.....	239,736	78,771*d*
9 mo. end. Sept., 1930.	4,011,646	3,356,172*a*	.....	670,396	195,361*d*
9 mo. end. Sept., 1929.	4,253,421	3,442,786*a*	.....	833,346	350,444*d*
Mexico Tramways, Mexico City, Mex. (In Pesos)					
September, 1930	817,520	918,940*a*	.....	*101,420*	.....
September, 1929	865,671	859,179*a*	.....	6,492	.....
9 mo. end. Sept., 1930.	7,541,310	8,133,150*a*	.....	*591,840*	.....
9 mo. end. Sept., 1929.	8,128,558	7,995,204*a*	.....	133,354	.....
Saskatoon Municipal Railway, Saskatoon, Sask.					
8 mo. end. Aug., 1930	252,508	178,751	9,886	63,871	*27,460*
8 mo. end. Aug., 1929	.....	.....	.....	.....	9,902
Lethbridge Municipal Railway, Lethbridge, Alta.					
7 mo. end. July, 1930	31,788	27,829	.....	3,959	*14,137*
7 mo. end. July, 1929	.....	.....	.....	.....	*10,944*

Italic figures indicate deficit. *a* Includes taxes. *b* Balance for return on investment *c* Withdrawn from fare control fund. *d* Before depreciation. *e* Before Manhattan 5% dividend. *f* Before income bond interest, and in 1930 before Broadway and Seventh Ave. bond interest in default. *g* Net after rents. *h* Including Brooklyn & Queens Transit System. *j* After fixed charges and dividends. *k* After Manhattan Elevated rental.

A.E.R.A. Executive Committee Meets in New York

CONSIDERATION of matters of national and local policy and the reports of committees constituted the principal business of the executive committee, A.E.R.A., at its meeting held in New York on Nov. 20.

C. D. Cass, general counsel, told of efforts to enlist action of member and non-member electric railways on behalf of an effort to secure from the government increased mail pay. There has been, he stated, no increase in mail pay to electric railways since 1925, although steam railroads less than 100 miles in length were granted an increase in 1928. The Parker bill for regulating interstate bus and truck operation, Mr. Cass reported, is still pending before a committee of the U. S. Senate. All recommendations on Referendum No. 57, being the report of a special committee of the United States Chamber of Commerce on water power development, were approved.

Contract for the use of the Atlantic City auditorium for the 1931 Convention has been signed, and arrangements for entertainment and meetings were well under way. Representatives of a score or more of the leading manufacturers, constituting the exhibit committee, have assured a large exhibit by agreeing to take as much or more space as their respective companies had used at the previous exhibit.

Leslie Vickers, economist, told of a recent meeting of the committee on fare structure, at which a resolution was passed soliciting the full support of the executive committee in obtaining from state and local regulatory bodies a wide degree of leeway in permitting local street railway companies to engage in fare experimentation.

Edward Dana, reporting for the committee on employee relations, stated that a foremen's training conference had been arranged for the Chicago area, and that preparations for holding similar training classes in other sections of the country were under way.

Cleaning Cars and Equipment by Sand Blast Saves Much Time and Money

SANDBLASTING of car equipment of the Pacific Electric Railway has proved more efficient and cheaper than the method of hand cleaning formerly used. Particularly in the cleaning of trucks its advantages are outstanding. Total elimination of all grease and dirt is possible, and all parts of the truck are cleaned down to the metal, affording better opportunity for the detection of fractures. Because all dirt and grease are confined to the sandblasting room, and not scattered around the main shops, general cleaning of equipment by sandblasting has improved the appearance and cleanliness of the repair shops on this property.

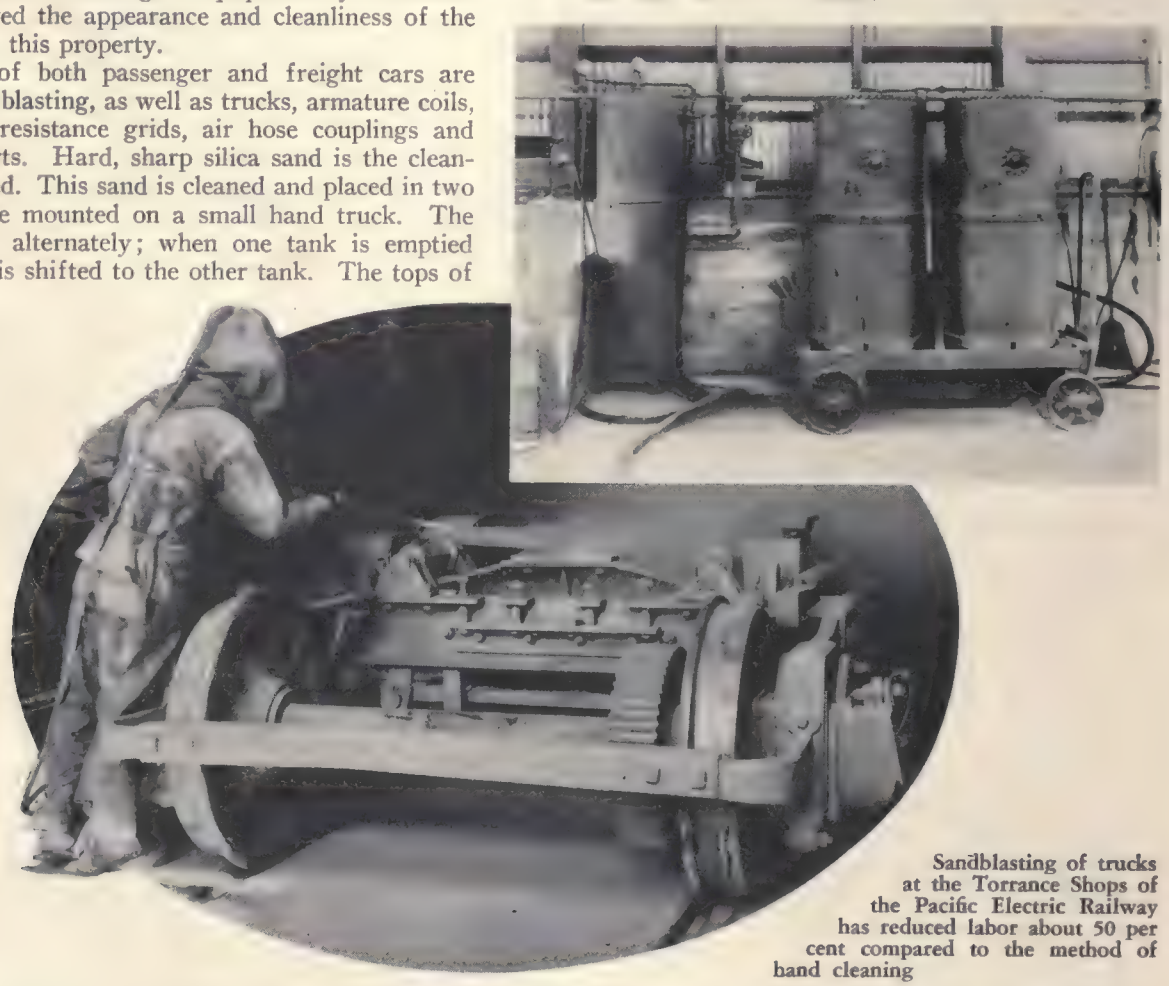
The bodies of both passenger and freight cars are cleaned by sandblasting, as well as trucks, armature coils, brush-holders, resistance grids, air hose couplings and many other parts. Hard, sharp silica sand is the cleaning medium used. This sand is cleaned and placed in two tanks which are mounted on a small hand truck. The tanks are used alternately; when one tank is emptied the nozzle line is shifted to the other tank. The tops of the tanks are concave to facilitate filling. A working pressure of 90 lb. is obtained from the shop air line. The rest of the equipment consists of a shop-made nozzle, and 1½-in. heavy hose connected to a 1-in. pipe, which is further reduced to ¼ in. by means of a reducing coupling before it is connected to the supply tank. Two men are required to perform the regular cleaning of equipment. One man operates the nozzle; the other screens the sand and maintains a supply for the nozzle line. Miscellaneous cleaning is done by helpers as the occasion requires.

Except for trucks of passenger cars, no preliminary preparation is necessary in the cleaning of the equipment. It is taken into the sandblasting room and cleaned with little handling. Journals and the motor axle bearings of passenger car trucks are covered to protect them against the scouring action of the sandblast. The operator is protected with a Pulmosian helmet which covers the head and shoulders, and has a small air inlet in the top to provide ventilation.

The principal advantage of sandblasting is the saving in labor, as may be seen by comparing the labor time necessary for other cleaning methods. With the old method passenger cars were cleaned by removing the paint by means of a varnish remover, or by burning it off with a torch. This operation required the employment of four men for two days. Trucks were scraped of heavy mud or grease by hand requiring two men at least one day. Steel freight cars were cleaned by means of wire brushes, scrapers and putty knives, with a labor time of approximately 40 man-hours. Three man-hours were required to clean stripped armature cores with wire brushes and scrapers. Time required for typical cleaning operations with two men by means of sandblasting is as follows:

Steel passenger cars, including roofs and trucks	14 hours
Steel freight cars, complete	4 hours
Passenger car trucks, per car	4 hours
Steel gondolas, including trucks and frames	8 hours
Stripped armature cores	15 minutes
Brush-holders, resistance grids, air line hose couplings	2 to 5 minutes per article

Two supply tanks are used in the sandblasting operation. One is connected to the nozzle line, the other serves as a reserve



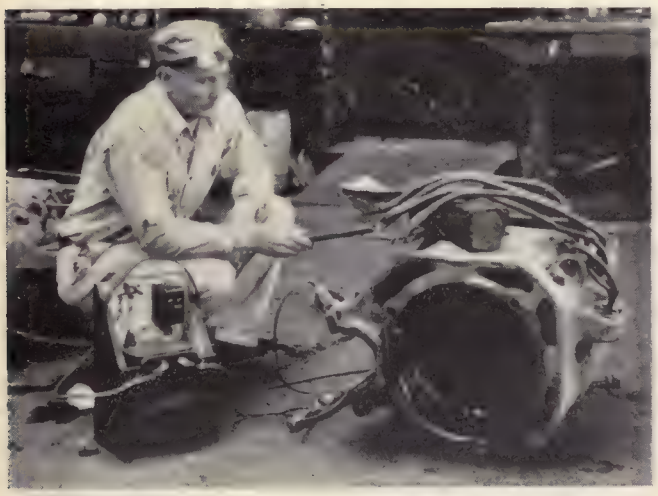
Sandblasting of trucks at the Torrance Shops of the Pacific Electric Railway has reduced labor about 50 per cent compared to the method of hand cleaning

Insulation Tested with Portable Transformer*

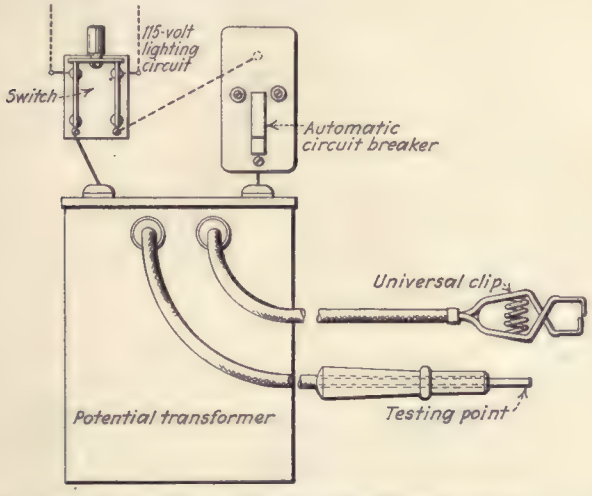
By A. Taurman

Superintendent of Equipment, Way and Structures
Birmingham Electric Company, Birmingham, Ala.

FIELD coils of motors, as well as motor leads, brush-holders, car cables, starting rheostats and other electrical equipment, are tested for grounds with a portable potential transformer set connected to a lighting circuit in the shops of the Birmingham Electric Company. The field coils are tested when the motors are overhauled without the necessity of moving the motor to the electric testing shop, and the auxiliary equipments are tested on the car.



Much handling of equipment is eliminated by testing insulation with a portable transformer set in the shops of the Birmingham Electric Company



The potential transformer has a transforming ratio of 1:11, which makes available a sufficiently large voltage for insulation test from the ordinary lighting circuit

The set used consists of a 200-watt potential transformer of the switchboard type which was modified to suit requirements, a double-pole single-throw knife switch, a 15-volt, 25 amp. cap, and an automatic circuit breaker set to trip at 20 amp. The latter are mounted with the transformer in a wooden box to which is attached a convenient leather handle. The primary 115-volt winding of the transformer is equipped with a No. 14 lamp cord and attachment plug for connection to the lighting circuit. This connection is made from the transformer through the knife switch and circuit breaker. Highly insulated leads of suitable length are brought out from the secondary winding of the transformer to be attached to equipment for test. One lead is equipped with a 50-amp. universal clip, the other with a testing point. The transformer is wound for a ratio of 1:11, producing a voltage ranging from 1,250 to 1,265 volts on the secondary, with a 115-volt primary. If higher voltage is required, the secondary may be wound for a higher ratio, or may be split for different ratios.

Weighing only 35 lb., the complete set can be carried about easily and tests may be made wherever it is suitable. The test is easily and quickly made. The universal clip is attached to the motor frame, and contact is made between testing point and field terminal, holding the contact from 20 to 30 seconds. If the insulation of the field coil breaks down, the circuit breaker will trip and open the primary circuit.

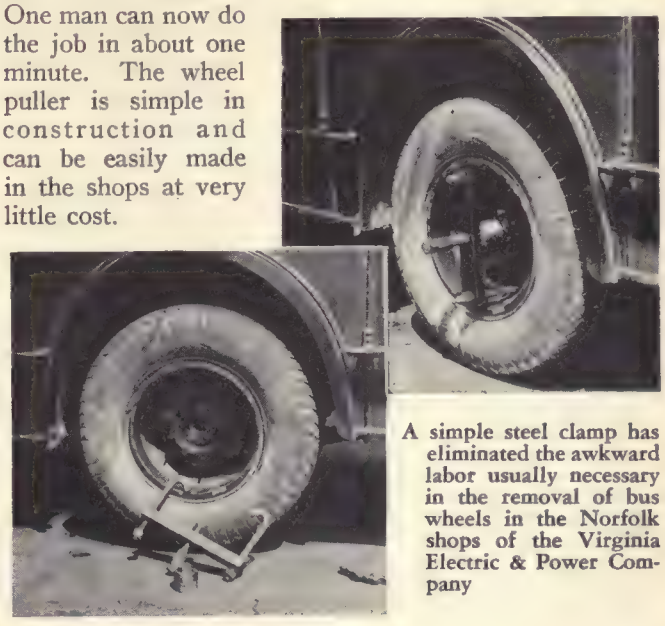
*Submitted in Electric Railway Journal *Prize Contest.*

Bus Wheels Removed With a Simple Clamp*

By C. B. Hall

Chief Clerk Mechanical Department
Virginia Electric & Power Company, Norfolk, Va.

REMOVAL of wheels from the Model 65-A White bus is facilitated by the use of a wheel puller designed by the mechanical department of the Virginia Electric & Power Company, Norfolk, Va. This device is primarily an adjustable steel clamp made with 1-in. steel rod fitted into a body piece measuring 18x3x1½ in., which has a hexagon head screw 8½ in. long, threaded at the center. The diameter of the screw is 1½ in. A steel cylinder 3½ in. long is machined with a socket end for taking the screw, and a ¾-in. projecting plug end for insertion against the axle tubing. By turning the screw with a wrench against the cylinder and having the clamp ends tightened, the wheel is easily and quickly removed from the axle. Wheels were formerly removed with a jack and tools, requiring the labor of three men for from 30 to 45 minutes. One man can now do the job in about one minute. The wheel puller is simple in construction and can be easily made in the shops at very little cost.



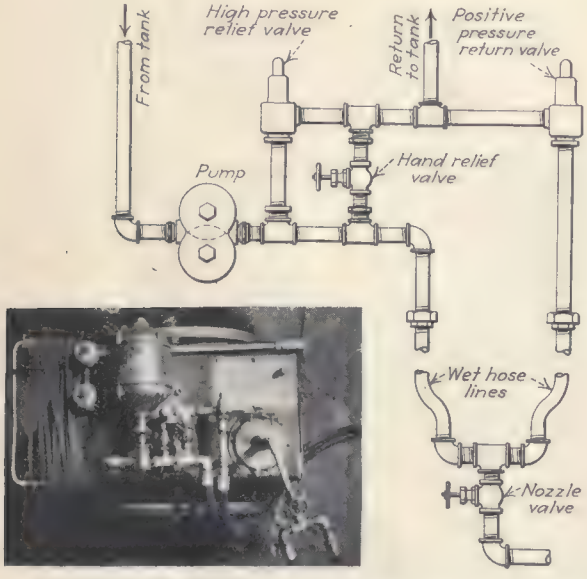
A simple steel clamp has eliminated the awkward labor usually necessary in the removal of bus wheels in the Norfolk shops of the Virginia Electric & Power Company

Pump and Heater Facilitate Transmission Filling*

By Leonard S. Rose

Assistant Superintendent Motor Coach Department
Cleveland Railway

FILLING of transmissions and differentials on buses operated by the Cleveland Railway has been facilitated by the use of a lubricant pump and heater developed by the motor coach department. Lubricant for the transmission and differential is carried in a standard rectangular oil buggy. On this a small direct-driven gear pump has been mounted. The output from the pump is delivered to a "wet hose" line, with a return hose to the tank which operates against a positive pressure return valve. Use of the wet hose return permits circulation of warm lubricant through the hose line so that the grease is fluid at the filling nozzle, even though some time elapses between periods of use. A



Positive delivery of lubricants to the bus transmission or differential is insured by use of this motor driven pump and heater combination

high-pressure relief valve protects the motor from overloads caused by the presence of cold grease in the hose line. The positive pressure valve insures a minimum delivery rate at the nozzle regardless of viscosity of the lubricant or its temperature. Flow from the nozzle is controlled by a small globe valve which may be regulated by the operator. In this way time can be given for the lubricant in the differential to level off and overfilling is prevented.

Since lubricants satisfactory for the purpose have high viscosity at average garage temperature, it has been found highly desirable to install an immersion heater in the bottom of the oil tank. This heater is connected up several hours before the tank is to be used, so that a satisfactory temperature will be obtained to permit easy flow of the lubricant and rapid leveling in the differential, as well as to give a lower load on the pump motor. A thermostatic heat control has not been installed, although it might be used if desired.

The initial investment and slight charge for power for the heater are more than offset by the quality and rapidity of the work done. A better job is done now with one man than it was previously possible with two.

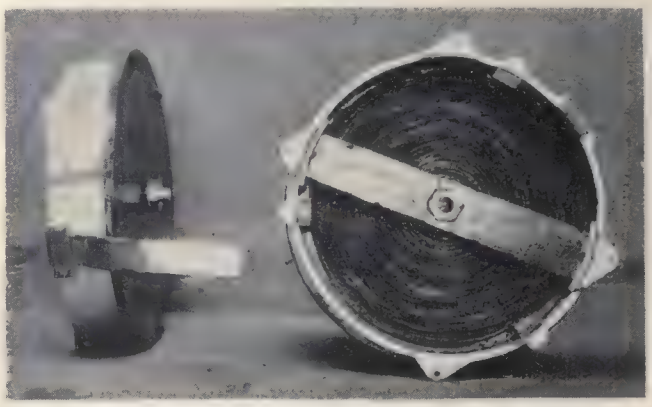
*Submitted in Electric Railway Journal *Prize Contest.*

Radio Interference from Cars Eliminated by Choke Coil

By A. S. Warner

Transmission and Distribution Department
Metropolitan Edison Company, Reading, Pa.

INTERFERENCE to radio reception caused by the commutation of motors on the cars of the Reading Transit Company, Reading, Pa., has been greatly reduced by the installation of a spiral wound choke coil between the trolley and the driving motors. The coil has 65



Choke coil is housed in an aluminum casting and held in position by a transite strip and three wedges

turns of No. 35 strap copper, and is housed in a circular aluminum casting having a ½-in. transite top from which the coil is hung by means of a center stud. Starting at the center stud, the coil is wound in a spiral with asbestos tape separating the turns. It is held in a fixed position in the aluminum housing by three maple wedges and by a 2½-in. transite strip. The coil is placed in the main bus line with the outside terminal connected to the trolley end and the terminal at the center stud to the motor end.

A filter arrangement, consisting of a choke coil and a condenser, would be more effective. The choke coil,



Installation of choke coil between trolley and motors on cars of Reading Transit Company has eliminated 95 per cent of radio interference

however, gave such satisfactory results that it was decided to use it alone. It was found to eliminate 95 per cent of the interference. The coil, moreover, is of rugged construction and requires very little maintenance. Approximately 115 cars have been equipped with this type of coil since 1928 without a single failure to date.

To supplement the effect of the choke coil, the field coil of the compressor motor was connected between the armature of the compressor and the trolley. This connection gives whatever benefit there may be in the choking action of the field coil against any interference originating at the compressor armature.

Work Car Equipped to Spread Material Along Track



Movement of plow along car floor spreads material along both sides of track

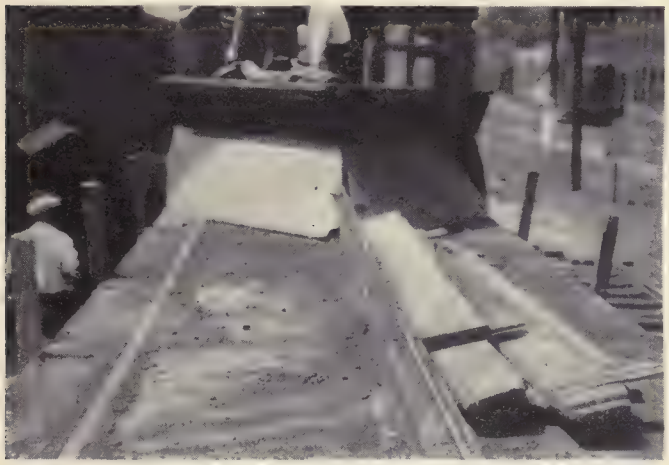
SPREADING of material along both sides of a track at the same time is accomplished with a work car built by the Stark Electric Railroad in its shops at Alliance, Ohio. An ordinary flat car is equipped with a plow, 4 ft. high, operating along a 12-in. I-beam which is placed along the center of the car floor. When the plow is moved forward, the material is spread along the sides at a rate determined by the speed of the plow and the speed of the car. The car is usually operated at 2 or 3 m.p.h. With planks placed along the sides, the car can be used for hauling and spreading ashes. With the planks removed, it can be used for hauling ties, poles and other similar material. When the plow is not in operation, it is placed near the control cab, leaving 42 ft. of clear car space for hauling material.

The auxiliary equipment for the operation of the plow consists of a 5-hp. motor, a steel drum, drum gears, and 100 ft. of steel cable. A wooden compartment, 30 in. high, 30 in. wide and 5 ft. long, incloses this auxiliary equipment. The wooden compartment is placed in the cab without interfering with the operation of the car. With the use of planks at the sides, about 20 cu.yd. of ashes can be loaded upon the car. The only manual labor necessary in unloading is for the removal of the side planks.

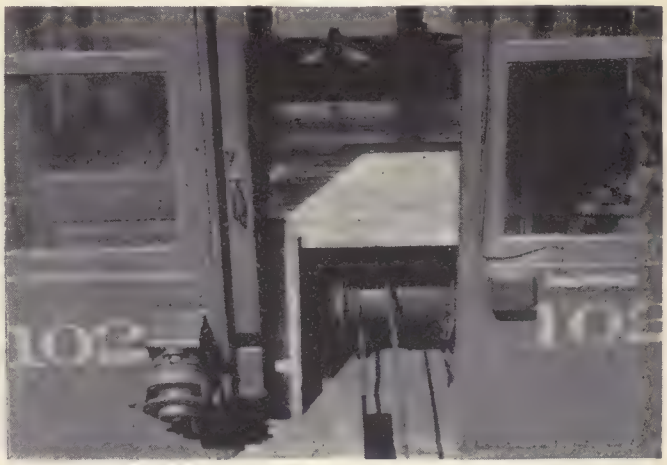
Remodeling Cars for One-Man Operation

CONVERSION of 65 front-entrance, center-exit, single-end cars for one-man operation is being carried out by the St. Louis Public Service Company. These cars, each with a seating capacity of 62, have been in service for about eight years as two-man cars. The brake valves formerly used on these cars are being replaced with a foot-operated self-lapping brake valve. The brake ratio based on the light weight of the car has been increased from about 100 per cent to 145 per cent. The operator is provided with a comfortable seat and is required to operate the car from a seated position at all times.

An emergency brake which is applied as a safety feature has been installed on each car and is intended to function only when the operator may not be alert and fails to hold it out of action. Electric heaters have replaced a stove heating system. The exit doors are operated by treadles and interlocked with the brakes in such manner that the brake is applied when the doors are opened and cannot be released by the operator until the doors are closed. The entrance doors are operated by air, but are not interlocked in any way with any other function of the car. Operation of cars on the rear end at slow speed is permitted with the back-up feature installed. Rattan seats have been faced around the edges with leather, and the seats themselves have been somewhat modified to make them more comfortable.



Steel cable pulls plow forward or backward along I-beam

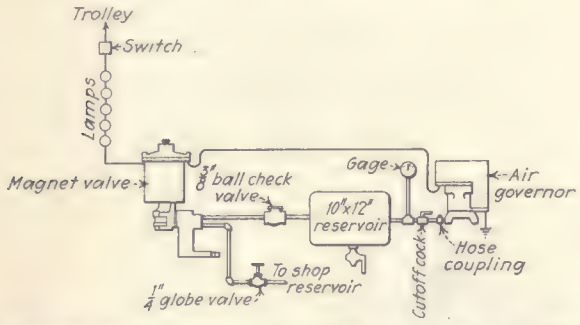


Auxiliary equipment is conveniently housed in the cab of work car

Testing Air Governors

By E. S. McGinnis
Foreman Electric Department
Dallas Railway & Terminal Company

AFTER overhauling governors it is often desirable to test them while they are off the cars. The Dallas Railway & Terminal Company makes this test by means of a simple arrangement, shown in the accompanying sketch, which consists of a ¼-in. globe valve, a ⅜-in. ball check valve, a 110-volt magnet valve with suitable resistance, a 10x12-in. air reservoir, an air gage, a ¼-in. cut-off cock, and necessary ¼-in. piping and fittings. Air pressure is obtained from a reservoir in the shop.



Arrangement used by the Dallas Railway & Terminal Company for testing air governors after having been overhauled

The governor to be tested is connected to the reservoir by means of a suitable hose coupling and wired to the magnet valve through one terminal and grounded through the other. To begin the test, the main switch is closed. The governor, being in the minimum pressure position, closes the switch in the magnet valve circuit and causes that valve to open. Air is then allowed to flow through the ball check valve to the reservoir and governor. When the pressure reaches the maximum value, the electric contact in the governor is broken and the magnet valve closes. Back pressure from the reservoir causes the ball check to seat at this point. Pressure in the reservoir and governor is gradually reduced by allowing air to leak off to atmosphere through a $\frac{1}{64}$-in. hole drilled in the wall of the check valve. The air leakage passes from this hole to the exhaust port of the magnet valve. When the pressure in the governor again reaches the minimum value, the electric contact is closed and the operation is repeated.

Insulating Paste for Bolt Heads*

By E. V. Lackey
Armature Room Foreman
Ottawa Electric Railway

MANY of the automatic circuit breakers in use on cars of the Ottawa Electric Railway have been damaged by an arc, which occurred with a heavy overload, jumping to an unprotected bolt head. This short circuited the terminals through the frame and often burned out the overload coil. These bolt heads are difficult to cover by ordinary means, but a method of applying paste was developed which accomplished the desired result. This paste, consisting of powdered asbestos and shellac, was applied over the exposed metal parts. The paste was then heated by a flame until enough alcohol was evaporated to allow a crust to be formed. In a few hours the whole body of the paste was hard and formed an excellent fireproof protective covering. This method has been so successful in preventing the former trouble that it is now used on all rebuilt and repaired circuit breakers.

Submitted in Electric Railway Journal Prize Contest.

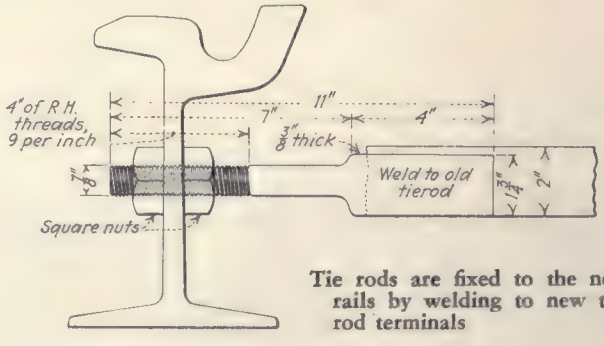
Economical Rerailing at Atlanta*

By D. S. Berman
Roadway Department Georgia Power Company
Atlanta, Ga.

DIGGING up less paving when laying new rails has been accomplished by the roadway department of the Georgia Power Company, Atlanta, Ga., by a new method recently adopted. It was desired to lay new rails in a street which was to be repaved by the municipality. The track foundation, of creosoted ties and grouted ballast, was in satisfactory condition and capable of lasting a number of years more. With the purpose of saving



Atlanta reduced paving cost by laying new rails on the old track foundation



Tie rods are fixed to the new rails by welding to new tie-rod terminals

labor and part of the paving, the new rails were laid by digging a 1-ft. wide trench on each side of the rail to the top of the ties, a section of paving about 2½ ft. wide remaining undisturbed along the center of the track. To pull up the old rails, it was necessary to cut the tie-rods. This was accomplished by burning them with a carbon arc about 7 in. from the rail. The relay rail was then laid in the trench and spiked to the ties. The old tierods were fixed to the new rail by welding one end of a new tierod terminal, 11 in. long, to the old tierod, and bolting the other end to the rail.

NEW PRODUCTS
for the Railways' Use

New Standardized, Light Weight Car Announced

INCORPORATED in the design of the new standard production model car, just announced by the recently organized General Car & Coach Corporation, are several features intended to lower first cost, operating and maintenance costs, increase speed, reduce noise and improve appearance. These objectives are to be attained principally by trucks equipped with worm drive and a new type of braking mechanism, and a carefully proportioned, lightweight body.

The car, which is equipped with two trucks and intended for city service, can be made either for single-end or double-end operation. In the former design seats will be provided for 52 passengers, and in the latter for 45 passengers. The estimated weight for the single-end car equipped with four motors, is 24,000 lb. For double-end it is 25,000 lb. Principal dimensions of the car are given in an accompanying table.

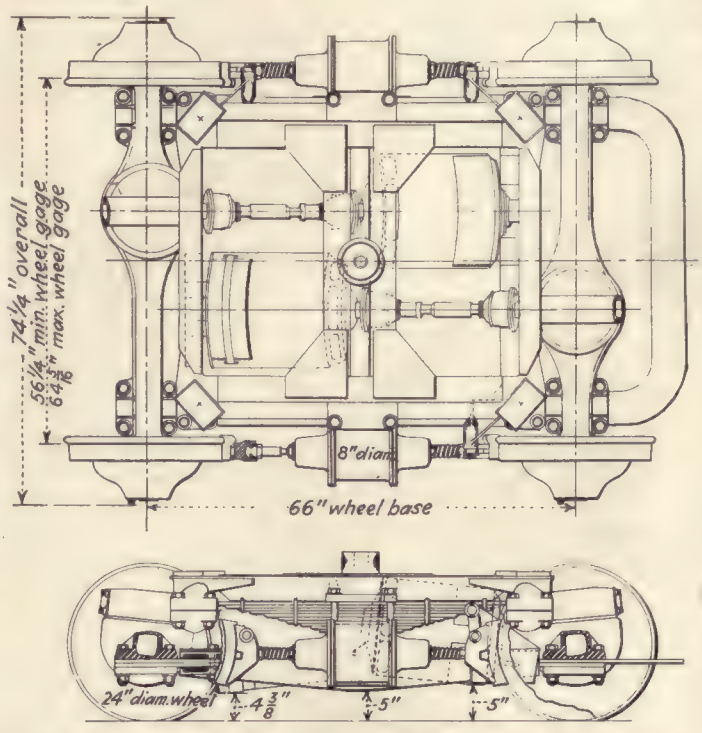
Although the weight of the car is only 24,000 lb. it has been so designed as to have adequate strength. The underframe and most of the body parts are to be of steel. Wheel guards are to be mounted on the truck to prevent wash on the underframe, an important factor in prolonging the life of the car. Particular attention has been paid to getting a low, racy appearance. A plain arch roof which extends on the sides to the windows, eliminating the letterboard, full streamline effect, wide windows, and a bumper on each end aid in giving this appearance. A double front door and a single rear door allow the use of the circulating load principle.

An unusual combination is service braking by foot and control by hand. Another feature is a hand brake for emergency use, similar to the type used in automobiles. Either Westinghouse or General Electric electrical equipment can be furnished.

Distinctive points in the design of the trucks are side mounted brake cylinders for actuating brake shoes, propeller unit disks for emergency braking, fully housed worm drive axles, rubber insulation of metal parts, four corner bearing plates, an axle aligner and wheel guards.

In the new braking system adopted, practically all brake rigging is eliminated. As may be seen in the drawing of the truck, a cylinder is mounted on each side to receive applications of air when it is desired to stop the car. Forcing a piston in each direction from the center, the conventional brake shoes are pressed against the wheels simultaneously. Aside from the elimination of conventional rigging, with its attendant noise, weight and necessity for frequent inspection, an advantage claimed for this system is that it can be inspected easily from the outside of the car and adjusted with the use of only two wrenches. The cylinders are connected to the air piping on the underframe by flexible tubing. As mentioned previously the air brakes are controlled by a pedal.

Supplementing the air brake is an emergency brake, which uses a disk, mounted on the propeller unit, and a handle similar to that used in automobiles for the operator to bring the shoes against this disk.



Details of the new truck, showing the brake cylinders and shoes, four bearing plates, stiffening bar and worm drive axle

Timken worm-drive axles, with each drive shaft mounted over the main axle, are to be used. The axles are to be inclosed with a single piece housing. No differential is used. Journal bearings are to be lubricated by Alemite fittings. The two motors for each truck are to be mounted on the cross members of the frame, giving full spring suspension for their weight.

Noise is to be reduced to a minimum by the elimination of all metallic connections, with the exception of the motor leads to the body. The springs are supported in rubber, as well as all other frame members. An innovation is the use of a graphite bronze bearing plate at each of the four corners of the frame. An important member of the truck frame is a U-shaped bar which passes underneath the two axles and extends around one of the ends. It is designed to keep the axles in perfect alignment.

Arrangements for the manufacture of this vehicle have been made with the St. Louis Car Company, St. Louis, Mo. Sales headquarters of the new company are at 100 State Street, Albany, N. Y.

Principal Dimensions

Length over buffers	40 ft. 1⅜ in.
Length over door posts	28 ft. 6 in.
Width at belt rail	8 ft. 3 in.
Height, rail to roof	9 ft. 8¼ in.
Height, floor to headlining	7 ft. 2 in.
Height, rail to first step	15 in.
Height, step to floor	13 in.
Post centers	47 in.
Seat spacing	30 in.
Wheelbase of truck	5 ft. 6 in.
Pivot centers of trucks	19 ft. 7 in.
Diameter of wheels	24 in.

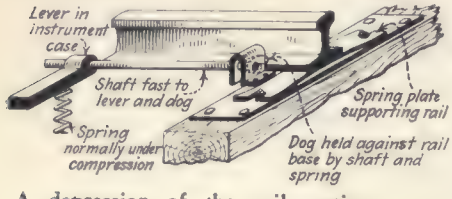
Highway Crossing Signals Controlled by Mechanical Rail Contactors

INCREASING interest is being shown by interurban electric railways in mechanical signal control. Several steam railroads have recently replaced track circuits by rail contactors in automatic signal territory to avoid cutting into the signal track circuits. With the track circuit type of control it is often necessary to rearrange two or three signal circuits or to install additional ones in order to secure proper operation of one



Mechanical rail contactor for controlling highway crossing signals, actuated by the downward movement of a spring supported rail

highway crossing signal. With a rail contactor known as the "Fusticlo," manufactured by the Louisville Frog, Switch & Signal Company, of Louisville, Ky., the control circuit is entirely independent of the track circuits. The Illinois Terminal System and the Northern Ohio Interurban Company are among those using this rail contactor.



A depression of the rail resting on a spring plate causes a turning of the dog held against the rail base, thus producing rotation of the shaft which actuates the contacts

A spring plate is placed between the rail base and tie, raising the rail about ⅜ in. Spikes are lifted about the same amount on the two ties each side of the tie bearing the spring plate, so that the hump in the rail spreads over five ties. A dog rests on the top of the rail base at point where the spring plate is located. This dog is securely fastened to one end of a shaft which has a lever fastened to its other end. A spring, normally under compression, is placed under the lever. The dog is thus forced against the rail base by the compression spring. This compression spring, however, is not of sufficient size to effect the deflection of the rail in the least. The other end of the lever engages the mechanism which operates a circuit breaker.

In operation, a train approaching the point where the spring plate is located depresses the rail and flattens the spring plate. When the rail is depressed the dog on the base of the rail follows the rail downward, due to the action of the compression spring, turning the shaft and moving the end of the lever which engages the mechanism upward.

There are two types of rail contactors in use at present, directional and non-directional. Directional instruments are commonly used as starters on single track. They are so arranged that contacts which are actuated by a train going in one direction will not be operated by a train moving in the opposite direction. In some special cases two sets of contacts are used in a directional instrument, in which case, one set operates for a train moving in one direction, while the other set will operate for a train moving in the reverse direction.

Non-directional instruments are used chiefly as stopping or cut-out instruments and also for starters on double track where no reverse movements occur. They have contacts which are operated by trains moving in either direction. The principle of operation is the same as the directional type, except that no selective device is employed.

Light-Weight Bus Body Introduced for Ford Chassis

MEETING the demand for a moderately priced light-weight bus body to be mounted on the Ford Model AA 157-in. chassis, the Fitzjohn Manufacturing Company, Muskegon, Mich., offers a 21-passenger body in street car and parlor coach styles. The manufacturer states that it combines the feature of light weight with comfortable seating arrangement, ample headroom and aisle space.

Principal dimensions of the body are: belt length, 196 in.; belt width, 86 in.; headroom, 70 in.

The body weight has been held within the allowance necessary for mounting on the Ford chassis by the adoption of special body framing and lightweight metal bracing. It is claimed that the parlor coach body, completely equipped, weighs not more than 2,500 lb. Specially designed Ypsilanti Reed Furniture Company seats provide the necessary comfort and knee room.



Parlor coach body is equipped with inside baggage lofts for intercity operation

Attention is directed by the manufacturer to the fact that the cowl and dash assembly, being the type regularly furnished on Ford chassis, makes possible the mounting of these bodies at any point in the country.



This Fitzjohn bus body is designed for mounting on Ford Model AA 157-in. chassis

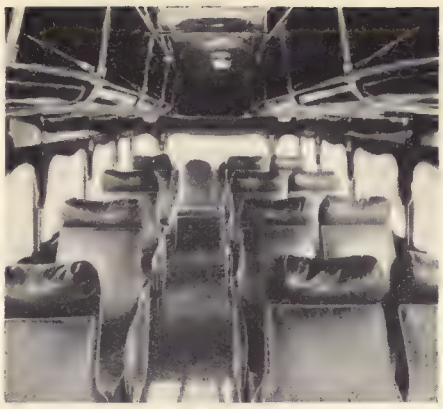
The framework is of seasoned ash and maple. New "Galvaneel" steel window sash by O. M. Edwards Company, and one-piece plate glass hinged windshield have been adopted. The entire rear end of the body, including the top roof corners, is of metal. Appearance is enhanced by a military front with a cadet visor and by the use of window eaves around the side windows. The parlor coach body is also fitted with ornamental grille window valances, and a Hunter roll sign together with a rear drum sign.

The interior is trimmed with textile ceiling and lacquered Masonite panels. Linoleum floor covering and Diamondette safety tread for entrance steps have been adopted. A spare tire is located on the left front side of the body. The rear bumper is of tubular steel and the side bumpers are of single bar cold-drawn steel. Accessories include a rear-view mirror and an automatic vacuum windshield wiper.

Additions in the Field of Low-Capacity Buses

TWO six-cylinder buses, a 16-21-passenger pay-enter city type and a sixteen-passenger interurban type, have been added to the line of the White Company. These buses are mounted on the Model 613 bus chassis and are designed for service where economical operation and flexibility in traffic are of major importance. Both have Bender bodies.

The interurban type has sixteen fully upholstered parlor car type seats of lightweight construction. The seats are liberally spaced and are equipped with concave head rests and hat clips on the back. Over each seat is a small dome light, eight in all, mounted under the baggage rack.



Comfortable and attractive interior of new White intercity bus

The seating arrangement provides for a row of single seats on the right side of the aisle facing forward and a row of two-passenger seats on the left side. A lightweight aluminum grille work, with a small target sign, incloses the two spare tires mounted in the rear. Space is provided above the rear roof of the body for handling excess baggage; interior racks may be used for hand baggage. The upper part of the pull-up windows is trimmed with a valance which extends down on each window post to the top of metal-framed mirrors. The heater is of the hot water type placed to the right of the dash. Four roof ventilators are arranged so as to provide an adequate supply of fresh air. General illumination is obtained from four large dome fixtures which are mounted in the roof.

General specifications are as follows:

Wheelbase, 180 in.
Net weight, approximate, 9,800 lb.
Length over-all, including bumpers, 24 ft. 8 in.
Dash to end of body, 18 ft. 7 in.
Center of rear axle to end of body, 72⅝ in.
Outside width, 78 in.
Headroom, at front, 72 in.
Headroom, over rear axle, 68 in.
Seat centers, 33 to 37 in.

Economy of operation and long life are the claims made by the manufacturer for the pay-enter body. The weight of this body has been held to a minimum. A generous seating space of 33 in. affords the comfortable room usually found in a de luxe type bus. Interior width is 84 in., using double seats measuring 34 in. with an aisle space of 16 in. An attempt has been made to eliminate the crowding effect of the small type bus by providing a headroom measuring 76 in. at the front door. This is made possible without undue over-all weight by a double drop-frame feature.

The 4-A engine used in the Model 613 is a six-cylinder "L" head type, 3 3/4-in. bore and 4½-in. stroke, with clutch and transmission mounted as a unit. It has a rigid crankshaft, mounted in seven main bearings, and a detachable head with machined combustion chambers. This engine delivers a torque of 175 ft. lb. at 1,000 r.p.m. Full pressure lubrication is supplied to all main connecting rods, camshaft, piston pin, accessory drive and chain idler bearings. The clutch is the White single-plate type operating in oil. All transmission gears are of chrome nickel, steel-carbonized and heat-treated. The rear axle is a one-piece steel casting with a single reduction of the semi-floating type. Brakes are the four-wheel internal-expanding type with molded lining, operated hydraulically with vacuum booster. Standard equipment includes 7.50-20 balloon tires, single front and dual rear.

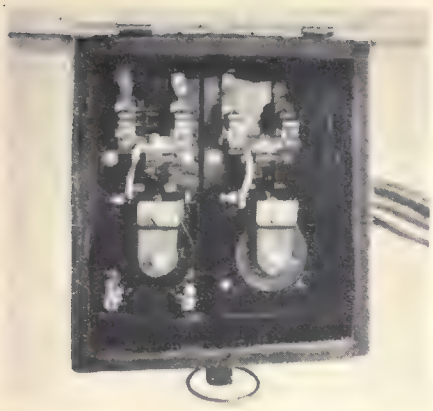


New pay-enter bus for city service developed by the White Company

Compact Field Shunting Switch

COMBINING the functions of two ordinary switches for shunting the fields of a pair of series railway motors, a lightweight switch, Type UM-22, with a novel arrangement of contacts, has been brought out by the Westinghouse Electric & Manufacturing Company.

As most railway motors are connected in parallel pairs, two switches for a pair of motors would always be connected together on one side. It is unnecessary, therefore, to bring out four leads, making possible a double-pole switch in which the moving contacts are not insulated from each other, and which has two incoming leads and a single outgoing lead. Since an important factor limiting the width of a conventional double-pole switch is the spacing between moving contacts for insulation, a switch can thus be made extremely narrow with



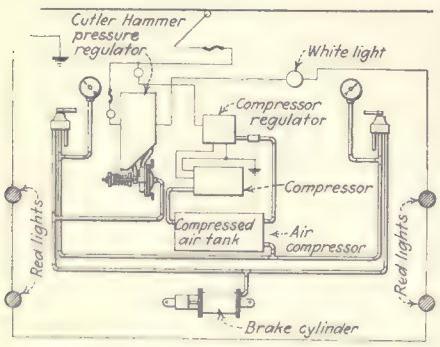
This contactor box contains two switches for four-motor equipments. Narrow spacing of moving contacts makes possible a reduction in weight

the two moving contacts mechanically and electrically interconnected. Equalization of contact pressure between pairs of contacts is obtained by the use of resilient stationary contacts and the usual spring in the moving mechanism.

One switch suffices for two-motor equipments and two switches for four-motor equipments up to 60-hp. rating. The switches and current limit relay, which controls them, are each inclosed in a sheet metal box for under-car mounting. For four-motor equipments, the Type UM-22-A field shunting contactor box, weighing about 45 lb., the Type TS-27 current limit relay box, weighing about 30 lb., and the Type M field shunting resistor, weighing 18 lb., are recommended by the manufacturer. Field shunting equipment for two-motor equipments weighs 25 per cent less.

Signal Lights for Car Stop Warning

AUTOMATIC operation of a safety signal system to warn pedestrians and motorists that a car is about to stop has been developed by Ashley Hale, West Groton, Mass. The danger signals are displayed at the front and rear end of the car whenever any appreciable amount of air is admitted into the brake cylinder.



Warning signals operated by the flow of compressed air through the brake control

Operation is controlled by means of a Cutler-Hammer pressure regulator, Type C, which is incorporated into the braking system, as shown in the illustration. It is connected to the cylinder pipe so that, when air is admitted under pressure in any quantity to the brake cylinder, it will also be admitted to the pressure regulator. The lights are placed in series and are in circuit with the regulator which is fed directly from the trolley through a fuse and a switch. A clear lamp is placed inside the car and two pairs of red stop-indicating lamps are located on the dashers.

Rugged Thermostat Designed For Close Heat Control

RELIABILITY, rugged construction, neat appearance with no exposed screws, adjustments or openings in the cover to invite tampering by meddlers, are the advantages claimed for the heat-control instrument known as the No. 690 Arcostat, which has been designed by the American Radiator Company primarily for use on electrically heated street cars and buses. The instrument is finished in black enamel with Bakelite base, and has a snap-action contact by means of a permanent magnet. It is said to be unaffected by vibration, rolling or stopping of the car.

The differential of the instrument itself is $\frac{1}{5}$ of 1 deg. The actual differential obtainable on air temperature will depend upon the rapidity of air movement over the instrument, and the rapidity of temperature change. The more rapid the air movement and the slower the temperature change, the closer will be the control. However, the actual operating differential under any specific set of conditions can be determined only by a test. All adjustments are made at the back after removing the cover by means of a special screwdriver. The instrument is fixed to the wall by screws with heads, requiring a special wrench or key. There is no opening in the cover. Due to the use of a liquid-charged bellows element, this instrument will continue indefinitely to operate at the degree set.



Mats can be placed in step-wells and above step, being held securely in place with special molding strips

Tread Flooring for Safety and Cleanliness

UNDER the trade name of "Safety Treads," a novel type of flooring with grooved construction is marketed by the Melflex Products Company, of Akron, Ohio. It is claimed that this type of flooring prevents slipping by gripping the soles of shoes and that the grooves collect the moisture, sand and dirt to eliminate the excessively fast wear that would result if the gritty dirt were collected and ground into the treads.

The flooring is made from strong cotton cords embedded in a rubber compound, vulcanized and cut into strips. Each strip is then dipped in a special rubber cement and molded onto a tough rubber base. The strips in the tread are separated by grooves approximately $\frac{3}{8}$ in. wide.

This material is now in use on the cars of the Youngstown Municipal Railway and the trolley buses of the Department of Street Railways, Detroit.



Safety treads installed in the aisle of a Birney safety car

NEWS *of the Industry*

LATE NEWS

Dayton, Ohio.—The Cincinnati & Lake Erie Railroad, which connects Cincinnati, Dayton, Springfield, Columbus and Toledo, made a material cut in rates over the Thanksgiving holidays. The round-trip fare between any two of these places was the cost of a one-way ticket plus 10 cents.

✦

Boston, Mass.—The ninth annual educational program for the employees of the Boston Elevated Railway, just begun, will continue through March of next year. It will consist of sixteen courses and a series of forum meetings with prominent speakers. Last year more than 400 received certificates for successful completion of courses.

✦

Fort Wayne, Ind.—Robert M. Feustel, executive vice-president of the Midland United Company and chief operating head of the Insull utility group in Indiana, has been appointed chairman of the public utility division of Governor Leslie's state unemployment commission. At the preliminary conference of the commission called by the governor Mr. Feustel stated that efforts would be made to start the construction program by Jan. 1 instead of in the spring as originally planned.

✦

Chicago, Ill.—Officials of the Chicago Rapid Transit Company and associated transportation companies have received many commendations as the result of the service of a first aid and medical department at two recent large gatherings near Chicago. One gathering was at the National Air Races and the other at the state convention of the American Legion in Aurora, Ill. In each instance the Rapid Transit first-aid unit was the official medical organization of the event.

✦

Birmingham, Ala.—Control of the Alabama Bus Company and the Capital Coaches, Inc., has been purchased by the Consolidated Coach Company, Lexington, Ky. Mileage covered by the Consolidated will be 5,000 miles, operating 350 modern motor coaches. Birmingham will be on a through line from Mobile to Cincinnati and Washington. The new officers of the Consolidated company are: L. B. Herrington, president; J. P. Pope and Guy A. Huguelet, vice-president; A. A. Tuttie, secretary-treasurer. Messrs. Herrington and Pope are officers of the Kentucky Traction & Terminal Company.

✦

Rochester, N. Y.—The Public Service Commission has authorized the receivers of the New York State Railways to substitute buses for trolleys on its Laurelton-Browncroft route, here, and the town of Irondequoit. The fare to be charged is the regular 10-cent city fare to the city line and 5 cents from the city line to the terminus in Irondequoit, making the through fare 15 cents. City fares entitle riders to transfer privileges.

(*Late News Continued on Page 772*)

Rapid Transit Proposal Made at Montreal

Immediate Building of Eight-Mile Subway to Cost $65,000,000 Made on Behalf of Tramway in Plan Outlined by R. N. Watt

EMPHASIZING that steps should be taken immediately to meet the growing problem of traffic congestion and laying stress upon the fact that rapid transit is now recognized as a first fundamental in the growth of a city, R. N. Watt, assistant to the president of the Montreal Tramways, addressing members of the Rotary Club of Montreal on Nov. 18 brought to the fore the city's great need of subways as a solution to traffic and transportation problems. He submitted the following definite proposal:

1. The building of a subway of 8 miles, to be completed by 1936, with the following component parts:
(a) A north-south subway, running from Craig Street terminal to Laurier Avenue, with approaches from the latter station providing transfer under cover from the subway station to the car line—a distance of 2.35 miles. This would be located somewhere between Bleury and St. Lawrence Streets.
(b) The erection of an east-west subway, running from Atwater Avenue to Parthenais Street—a distance of 4.13 miles, located between Sherbrooke and Dorchester Street.
(c) A connection from the Craig Street terminal to the east-west line near Stanley Street, with a station at Dominion Square so designed as to give direct access to the C.N.R. and C.P.R. station—a distance of 1.40 miles.
2. The expenditure of approximately $65,000,000.
3. Certain minor modifications of the present contract between the company and the city of Montreal, which would permit the company to build and operate subways and, at the same time, protect the present investments of the company so that its financial position will not be adversely affected.
4. The guarantee of the bonds issued both as to principal and interest by the city.
5. A universal fare with universal transfer of seven tickets for 50 cents within the uniform territory.
6. Immediate action by the city authorities by which the above suggestions can be legally carried out and approved, and application to the Quebec Legislature to give authorization.

Mayor Houde, thanked the speaker. In his opinion the speech was the "best address I have ever heard on civic matters,

(*Continued on Page 774*)

The Business Outlook

BUSINESS shows more definite signs of having hit that hard-pan resistance level which in the past it has always encountered at about 20 per cent below normal. At this point apparently the fundamental human wants begin to reassert themselves. Basic industrial activity is still declining, but general trade has begun to expand at more than the seasonal rate. Money turnover is rising, commercial loans are expanding, currency in circulation is increasing with seasonal retail trade demand. As the automobile industry prepares to play its card courageously on next year's market, employment is being given some stimulus. Key commodity prices are firmer as resistance to further deflation grows. Bears in Wall Street and elsewhere apparently are beginning to look for winter quarters.

—*The Business Week.*

Economic Advantage Lies With Use of Electricity

Placing progress in transportation at the base of all industrial progress, Charles Gordon, managing director American Electric Railway Association, in an address before the southern district meeting A.I.E.E. at Louisville, Ky., on Nov. 19 showed how the dominating importance of the electric railway industry had stimulated the development of electric power, and pointed out the further opportunities of the electrical engineer in city planning.

Mr. Gordon traced the development of steam as power for railroad use and the early application of electric power to the problems of urban transportation. He showed how automotive power, coming into general use in the automobile, has made inroads into all phases of transportation, and how it has created a tendency in the minds of automotive enthusiasts to relegate electric urban transportation to the scrap heap. He said:

It seems particularly timely, that electrical engineers examine a little more closely than is usually done, the field of transportation in urban areas where the great electrical industry had its origin barely more than fifty years ago and where, in turn, it is already freely predicted that it is to be replaced by automotive power. In this examination we shall need to concern ourselves as much with economics as with engineering, for it is on the scale of economics that the achievement of engineers are finally weighed and finally judged.

With factual observations, Mr. Gordon spoke on the economics of the utilization of street space, showing how all forms of electric transportation were far more efficient than any means of service yet developed with automotive power. Mr. Gordon concluded:

It seems hardly conceivable that the enormous economic advantage of collective transportation by electric power will not be applied on a much larger scale in the future than at present, for the solution of the growing problem of traffic congestion in cities. It is true that a much higher standard of convenience and comfort for collective transit facilities is necessary. But compare it to the cost to the community of rebuilding our cities for automobile travel—the economic advantage is all with the electric power in the high traveled density of urban areas.

LATE NEWS

(*Continued from Page 771*)

New York, N. Y.—The city has been asked to make official study and report of suspended monorail system of transportation as a means of extending rapid transit relief to outlying districts in a resolution adopted by the Queens Planning Commission. The action follows an investigation of suspended monorail construction and costs, operation and safety features by traffic and transit committee of planning group.

✦

Toledo, Ohio—The Summit-Broadway line of the Community Traction Company, has been shortened by nearly three-quarters of a mile and the old Casino, once a popular amusement center of the railway on Maumee Bay, has passed out of existence as a transfer point, due to establishment of a new wye at LaSalle and Summit Streets as a meeting place for company cars and the Point Place bus line. A passenger station is being built by the company at that point.

✦

Newark, N. J.—According to Barron's, the loss sustained by the transportation division of the Public Service Corporation thus far this year practically offsets gains made by electric and gas departments, so that the earnings of the combined system are running at a rate approximately the same as in 1929.

✦

Kansas City, Mo.—The city has filed protest against an order of the Missouri Public Service Commission which authorized the Kansas City Public Service Company to increase weekly permits to 40 cents. The protest stated that the city had no opportunity to oppose granting of the new rate, which is an increase of 5 cents over previous fare basis. The cash fare is 10 cents. Holders display their permits and pay 5 cents additional for a ride.

✦

Milwaukee, Wis. — During the next several years large additional generating capacity for the territory served by the Milwaukee Electric Railway & Light Company will be made available with the building of the new $25,000,000 steam-electric generating plant at Port Washington. A federal permit has been granted for the necessary harbor improvements, and engineering work is being completed so that construction may proceed as quickly as possible. It is planned to have the Port Washington plant's first unit of 80,000 kw. capacity ready for operation during the latter part of 1932.

✦

New York, N. Y.—The Transit Commission called recently for public hearings to determine whether the Jamaica Central Railway, the New York Railways and the Second Avenue Railroad should continue one-man cars. The commission a year ago authorized their use of one-man cars if certain safety devices were installed. It is alleged that the companies failed to carry out this proviso. The commission has set Dec. 10 for consideration of the operation of one-man cars on the Graham Avenue line of the Brooklyn-Queens Transit Corporation.

Indianapolis, Ind.—Operating revenue of the former Union Traction Company for 1929 was $2,690,341, according to a report filed with the Madison Circuit Court by Receiver Brady. Gross income after deduction of operating expenses, taxes, etc., was $231,762. Total revenue from bus operations during the year amounted to $136,316 and expenses, $210,640. Last July the Union Traction Company was purchased by the Midland United Company and was succeeded on Aug. 1 by the Indiana Railroad. It is now being operated under centralized supervisory management in conjunction with the interurbans of the Interstate Public Service Company, Indiana Service Corporation and other subsidiaries of the Midland United Company.

✦

Salt Lake City, Utah—E. A. West, general manager Utah Light & Traction Company, speaking on the topic "Mass Transportation," told members of the engineering council that present conditions make railway extensions economically impossible unless railway companies are granted relief. He added that higher fares would not entirely solve the problem, and contended that the present paving tax should be eliminated. He said that the company, under present arrangement, is charged for pavement which causes an immediate decrease in its own business.

✦

Wellsville, Ohio—Discussion of terms of a new franchise for the Steubenville, East Liverpool & Beaver Valley Traction Company will take place here soon before R. H. Keay, chairman of the Council's franchise committee. The company's franchise expired on Sept. 19. Operations have been continued, pending arrangements for a new grant. In East Liverpool, a new grant is sought to replace the franchise which expired on Oct. 19. The company has asked continuance of the 7-cent city fare there, but wants the right to substitute buses for cars on a number of routes.

✦

Detroit, Mich.—The operating costs of the Detroit Municipal Railway were reduced $40,000 when the street railways commission decided to eliminate this sum from the funds regularly appropriated for the operation of private automobiles by employees of the system. Most of the cars owned privately but operated at public expense, are attached to the claims division.

✦

St. Louis, Mo.—The Missouri Public Service Commission has overruled a motion of the St. Louis Public Service Company for a rehearing on its petition for a permit to operate a bus line from Wellston, Mo., to the Overland Park district in St. Louis County. While the commission denied the company a rehearing, it pointed out that it would have no jurisdiction if the Public Service Company can obtain the necessary local consent for the line. Several sections of the Missouri Motor Bus Act appear to be in conflict, but to date the Missouri courts have not interpreted the various sections of the act. Pending a final decision, the commission has avoided assuming jurisdiction over bus lines as part of an urban system.

✦

New York, N. Y. — Samuel Untermyer, special counsel for the city in rapid transit negotiations, denies that there has been an agreement as to the price to be paid by the city for the rapid transit lines in a unification plan. Mr. Untermyer, in his statement, said: "The negotiations are, in point of fact, further from consummation than they have been in many months."

✦

Fonda, N. Y. — The recently devised plan of the New York Central Railroad to use the properties of the Fonda, Johnstown & Gloversville Railroad, in order that its unification proposals might conform to the demands of the Interstate Commerce Commission, has been approved by the commission. The agreement provides for readjustment of the rate structure prevailing on the interchange of freight traffic and a contract for the use of joint facilities at Fonda. Much difficulty was encountered during the consideration of separating the Fonda's steam from its electric properties under the commission's original order. Under the present agreement, the separation is unnecessary and the Fonda retains its independent status. The two roads believe that the new rate agreed upon will be beneficial to shippers.

✦

Louisville, Ky.—Recommendations for reductions in wages paid to officers and employees of the Louisville Railway are made in a report to the directors by a special committee of that body.

✦

New York, N. Y.—A monthly magazine, *Traffic Regulation,* devoted to street and highway traffic problems, edited by William Gruen with offices at 114 East 32d Street, has been established as a medium of exchange of discussions of traffic problems.

✦

Washington, D. C.—In order to prevent traffic congestion caused by the parking of interstate buses in downtown Washington, the Public Utilities Commission and the Commissioners of the District of Columbia have embarked on a program to force the bus lines to construct one or more union bus terminals. According to present plans, the police powers of the city will be invoked to route the bus lines through less congested areas. Thus it is believed that the bus lines will be induced to construct terminals and waiting rooms.

News Flashes for the Industry

TO SUPPLEMENT the service of the regular monthly issues of ELECTRIC RAILWAY JOURNAL, a separate NEWS service appears on 39 Saturdays during the year. This supplement keeps you in touch with fare increases, court decisions, association meetings, financial and corporate news, equipment purchases, changes in personnel.

Read the

Electric Railway Journal

NEWS!

Profitable Meeting Is Held by Iowa Operators

Concentrating on the problems among the most important for the industry to solve, the Operators' Section of the Iowa Electric Railway Association, 100 strong, in convention at Des Moines on Oct. 29 and 30, spent a valuable period. Among subjects discussed were fare collection, operating and maintenance problems, better service and its sale, the trolley bus, railway lubrication, stores accounting, improved transportation units, and bus operating costs. As an innovation, each manufacturer representative was allotted five minutes to express his ideas on "how to do the job better."

Frank V. Skelly, of the Des Moines Railway, chairman of the executive committee of the section, introduced Mayor Crouch who characterized the convention as a commendable co-operative endeavor in the advancement of the science of transportation. Kirk J. Keith, Des Moines Railway, then presided as chairman.

John F. Ohmer, Ohmer Fare Register Company, showed how the selling problem for the railways had changed, and emphasized the need for extensive analysis, research and experimentation. He analyzed the cost of operating taxicabs, buses, private automobiles and street cars, and pointed out that advertising should stress the economy of the street car ride more than other objectives. Mr. Ohmer said the zone fare system permitted transportation to be sold at an attractive price to people who wish to travel short distances. He recited results obtained in Cleveland.

In developing the unusual subject "Stumps in the Field," Henry Cordell, Chicago, North Shore & Milwaukee Railroad, told of ways and means of solving major problems which confront operating men. Among the "stumps" mentioned were pessimistic employees, neglected painting, deferred repairs, slow schedules, inadequate lubrication of journals, babbitts with faulty bases, poor contacts in electrical circuits, leaky slide valves in air-brake systems, improper center plate lubrication, insufficient wheel and axle inspection, unattractive equipment, troublesome water supply for hot water heaters, and unsatisfactory current collection. He stressed advantages of using the sliding collector and polishing the trolley wire.

Laurence Wingerter, Des Moines Railway, told of the problems and difficulties of his company in the past and related the accomplishments by the new management, including complete conversion from two-man to one-man operation, the purchase of 50 new cars, remodeling of 101 old cars for one-man operation, speeding up schedules, improving the power system, effecting major economies, adopting new trainmen's uniforms, installation of a new transfer system and establishment of a new publicity department. Mr. Wingerter told of the many efforts to merchandise the service and to improve public relations.

W. J. Clardy, Westinghouse Electric & Manufacturing Company, discussed the trolley bus comprehensively from the important standpoints of application, performance, maintenance, operating costs and advantages, supplementing his analyses with facts and data on the Chicago, Salt Lake City and Detroit installations. He also compared in detail figures of the street car, trolley bus and gasoline bus for both light and heavy traffic.

R. S. Neal, Texas Company, said developments in the lubrication of motors, journal boxes and bearings had aided materially in reducing car maintenance costs. Objectives sought are reduction of power consumption, maximum economy of oil, elimination of time and expense for waste saturation and reduction of shop work on bearings and journals. One of the main problems, he pointed out, is to maintain an oil film between bearing surfaces, changing solid friction to fluid friction, and to do this with an oil in which the internal friction of the oil itself can be kept down. Mr. Neal told of the tests made in Baltimore with oil seals and low-viscosity oils, and reported the satisfactory results obtained.

During the past fifteen months, the Des Moines Railway decreased its stores account approximately 27 per cent, employees 50 per cent, and wages 41 per cent, according to G. H. Brown, purchasing agent of the company, in his paper on "Stores Accounting." Although these savings have been accomplished mainly by the adoption of the four to five turnover per year plan on all articles excepting emergency stocks, several other factors have entered. Complete and accurate records must be kept, materials must be classified properly, the storage system must be effective, and procedure for handling requisitions must be logical.

In "New Units for Transportation," C. Dorticos, General Electric Company, told of recent developments in equipment for street cars and described in detail certain of new products. Among the developments he listed are controller units with a larger number of points, automatic control, adaptable for foot as well as hand operation, quick application and release valves, magnetic track brakes, motors with greatly improved commutating characteristics to handle the higher accelerating current necessary for increased speed, twenty lamps in series for improved illumination and low voltage cut-out lamps. In concluding, Mr. Dorticos told about several applications of this modern equipment.

In analyzing the costs of operating buses in city service, D. D. Bentzinger, Iowa Southern Utilities, discussed factors that influence the figures. Among these are operating speeds, accidents, braking, tires, shop equipment, maintenance, uniform gasoline, oil reclaimers and depreciation. In the operating report for the Burlington fleet of 29 25-passenger buses, for the period of July, 1929, to July, 1930, Mr. Bentzinger gave costs per bus-mile as follows: roadway, .010 cent; equipment, 2.348 cents; gasoline, 2.051 cents; conducting transportation, 7.467 cents; traffic, .008 cent; general and miscellaneous, .369 cent; depreciation, 3.00 cents; and total costs, 15.523.

On the first day delegates were entertained at luncheon by the Des Moines Railway. At the annual banquet in the evening C. W. Gifford, general manager of the Des Moines Railway, was toastmaster. The entertainment program was elaborate. On the second afternoon the delegates inspected the new cars and the shops at Des Moines.



Delegates to Iowa Operators' Convention held at Des Moines

Coming Meetings

Jan. 8—Society of Automotive Engineers, annual dinner, Hotel Pennsylvania, New York, N. Y.

Jan. 19—Society of Automotive Engineers, annual meeting, Book-Cadillac Hotel, Detroit, Mich.

Jan. 22-30—Central Electric Railway Association, Claypool Hotel, Indianapolis, Ind.

Jan. 29-30—Central Electric Railway Accountants Association, South Bend, Ind.

April 8-9—Central Electric Railway Master Mechanics Association, Hotel Secor, Toledo, Ohio.

April 16-18—Annual State Convention, Missouri Association of Public Utilities, Excelsior, Mo.

$2,177,000 Equipment Issue Offered

Drexel & Company, Philadelphia, Pa., offered for public subscription on Nov. 24 at prices ranging in return from 4 per cent for the May 1, 1931, maturities to 5.25 per cent for the June 1, 1940, maturities $2,177,000 of Electric Railway Equipment Securities Corporation 4½ per cent equipment trust gold certificates dated Dec. 1, 1930. The certificates will be certified by Fidelity-Philadelphia Trust Company, Philadelphia, as trustee, and will represent less than 75 per cent of the cost of standard electric railway cars and their electrical and other equipment, the remainder having been paid in cash. Title to the equipment will be vested in the trustee for the benefit of the certificate holders. The equipment has been leased at rentals sufficient to pay these certificates and their dividend warrants as they come due. These leases and agreements and the notes representing rentals thereunder due from the various lessee companies will be assigned to the trustee.

The General Electric Company, Westinghouse Electric & Manufacturing Company and the J. G. Brill Company own all of the capital stock of Electric Railway Equipment Securities Corporation, which will unconditionally guarantee rentals sufficient to pay the certificates and their dividend warrants as they come due.

The equipment trust certificates cover a total of 163 cars, distributed as follows: 100 to United Railways & Electric Company, Baltimore, Md.; 40 to Des Moines Railway; 10 to Fitchburg & Leominster Street Railway; 7 to Rockford Public Service Company; 4 to Kansas City, Kaw Valley & Western Railway and 2 (oil-electric) to Hoboken Shore Railroad, a switcher.

What's in *News of the Industry*

Rapid transit proposal for Montreal.
Electricity advantageous for transport.
Business seems to have hit hard-pan.
Ohio road makes special Thanksgiving rate.
Study of suspended monorail asked.
Pull-Ins Middle States meeting topic.
Fare increase sustained in Niagara Falls.
"Old Times," recalled.
Christmas posters new style.
California comfort cars in campaign.
New Springfield proposal.
Seventy-five cent holiday pass.
Demonstration of fire prevention by trolley.
"The tax that breaks the street car's back."
Latest Brill trolley buses delivered to Chicago.
York Railways accepts new cars.
Steel motor cars for L. I. R. R.
English railway orders equipment.
Antiquated trolleys should be scrapped.

Conspectus of Indexes for December, 1930

Compiled for Publication in ELECTRIC RAILWAY JOURNAL by

ALBERT S. RICHEY
Electric Railway Engineer, Worcester, Mass.

	Latest	Month Ago	Year Ago	Last Five Years	
				High	Low
Street Railway Fares*† 1913 = 4.84	Nov., 1930 **7.76**	Oct., 1930 **7.79**	Nov., 1929 **7.62**	Oct., 1930 **7.79**	Nov., 1925 **7.30**
Electric Railway Materials* 1913 = 100	Nov., 1930 **130.9**	Oct., 1930 **132.7**	Nov., 1929 **145.7**	Dec., 1926 **159.2**	Nov., 1930 **130.9**
Electric Railway Wages* 1913 = 100	Nov., 1930 **231.8**	Oct., 1930 **231.8**	Nov., 1929 **231.1**	Nov., 1930 **231.8**	Nov., 1925 **222.8**
Electric Ry. Construction Cost Am. Elec. Ry. Assn. 1913 = 100	Nov., 1930 **194.1**	Oct., 1930 **195.1**	Nov., 1929 **204.8**	Nov., 1928 **205.7**	Nov., 1930 **194.1**
General Construction Cost Eng'g News-Record 1913 = 100	Nov., 1930 **198.5**	Oct., 1930 **198.7**	Nov., 1929 **208.5**	Jan., 1927 **211.5**	Nov., 1930 **198.5**
Wholesale Commodities U. S. Bur. Lab. Stat. 1926 = 100	Oct., 1930 **82.6**	Sept., 1930 **84.2**	Oct., 1929 **96.3**	Nov., 1925 **104.5**	Oct., 1930 **82.6**
Wholesale Commodities Bradstreet 1913 = 9.21	Nov., 1930 **10.06**	Oct., 1930 **10.30**	Nov., 1929 **12.40**	Dec., 1925 **14.41**	Nov., 1930 **10.06**
Retail Food U. S. Bur. Labor Stat. 1913 = 100	Oct., 1930 **144.4**	Sept., 1930 **145.6**	Oct., 1929 **160.5**	Nov., 1925 **167.1**	Aug., 1930 **143.7**
Cost of Living Nat. Ind. Conf. Bd. 1914 = 100	Oct., 1930 **151.9**	Sept., 1930 **152.9**	Oct., 1929 **163.4**	Nov., 1925 **171.8**	Aug., 1930 **151.6**
Industrial Activity Elec. World, kw.-hr. used 1923-25 = 100	Oct., 1930 **103.2**	Sept., 1930 **110.7**	Oct., 1929 **134.6**	Feb., 1929 **140.4**	Dec., 1926 **101.7**
Bank Clearings Outside N. Y. City 1926 = 100	Oct., 1930 **81.5**	Sept., 1930 **82.7**	Oct., 1929 **111.8**	Oct., 1929 **111.8**	Oct., 1930 **81.5**
Business Failures Number	Oct., 1930 1943	Sept., 1930 1763	Oct., 1929 1543	June, 1930 1874	Sept., 1928 1348
Liabilities, Millions of Dollars	**74.19**	**56.56**	**30.11**	**114.40**	**23.13**

*The three index numbers marked with an asterisk are computed by Mr. Richey, as follows: Fares index is average street railway fare in all United States cities with a population of 50,000 or over except New York City, and weighted according to population. Street Railway Materials index is relative average price of materials (including fuel) used in street railway operation and maintenance, weighted according to average use of such materials. Wages index is relative average maximum hourly wage of motormen, conductors and operators on 136 of the largest street and interurban railways operated in the United States, weighted according to the number of such men employed on these roads. †Revised to 1930 Census. See explanation page 756.

Montreal Rapid Transit

(*Continued from Page 771*)

on civic problems, since I have been Mayor of Montreal." He suggested that the address be printed in pamphlet forms in French and English, and distributed to leading organizations.

In a lengthy address, Mr. Watt tendered his hearers a comprehensive ambitious review of the city's transportation and traffic problems, and entered into a detailed discussion of the necessity for subways. The title of his address was "Should Montreal Build Subways Now?" His conclusion—and it was emphatically that of the Montreal Tramways and of leading engineers—was "Yes." He cited authorities to show transit was the first fundamental in the growth of a city, and that the problem could be met in two ways:

1. By important expropriations, which will provide additional streets, or widening of existing streets, to carry the traffic, not only of tramways, but also vehicular and pedestrian traffic.
2. By placing a portion of the traffic underground thereby releasing the streets for the balance of traffic, or, in other words, building subways.

In regard to expropriations, he stated:

It must be borne in mind that the providing of additional streets will not help the problem unless, at the same time, grade separation is provided at the junction of the principal arteries. For example, it will not assist traffic moving north to widen St. Urbain to 80 ft., and still force the traffic to stop at St. Catherine, Ontario, Sherbrooke and Pine Avenue to allow the east-west traffic to flow. Either St. Urbain would have to go underground or overhead at these streets and the same would be true of other main north-south thoroughfares. Therefore in considering the question of expropriations we must, at the same time, consider the question of grade separations.

Subways constituted the second remedy, Mr. Watt stressed, outlining the previously mentioned proposals for north and south-bound and east and west-bound subways, and the branch line. The estimated cost was $65,000,000 and the first question was: "How is the $65,000,000 to be raised, and from what source will the revenue be obtained to pay the interest and the sinking fund, which would amount, at the outset, to approximately $3,500,000 annually?"

EXHAUSTIVE PRESENTATION OF CASE

Supposing that the question was approved and it was decided to spend $65,000,000, necessitating an additional annual revenue of $3,500,000, the best way to obtain this amount, according to authorities (and Mr. Watt cited many), would be to distribute costs in three ways:

1. A share paid by the users of the service.
2. A share from the general revenues of the city.
3. A share by the property owners adjacent to the subways.

In regard to methods of payment, he first considered No. 3, payment of a share of the cost by property owners adjacent to the subway, stating that the history of subways in other cities establishes that immediately a subway was decided upon, property adjacent to it increased in value.

He said that if the fares were raised 1 cent, it would mean an additional revenue of slightly more than $2,500,000. If, instead of selling four tickets for 25 cents, seven tickets were sold for 50 cents, the annual receipts of the company would be increased by about $2,000,000 immediately. That is, if the fare were increased 1 cent, an amount inconsequential compared to the benefits accruing.

The extent to which Mr. Watt went into the details of the situation is instanced by the fact that the report of his remarks covers 22 typewritten pages.

Pull-Ins and Other Topics Enlivened Middle States Meet

Sixty members of the Middle Atlantic States Equipment Men's Association attended the third annual fall meeting at Ocean View on Nov. 11 and 12. On the first day of the meeting J. S. Dean, engineer Westinghouse Electric & Manufacturing Company, reviewed the work accomplished by the Electric Railway Association of Equipment Men, Southern Properties, in reducing pull-ins and improving maintenance costs. The members present received this talk with great interest and the lively discussions which followed indicated the importance attached to this work. The afternoon was taken up by the presentation of interesting motion pictures. "Modern Trends in Urban Transportation" was presented by L. E. Carter, General Electric Company; "A Treadle Travelogue," presented by A. Frank Paul, National Pneumatic Company; "Car Washing Machine," presented by B. A. Tozzer, Leeds, Tozzer & Company. Discussion followed each presentation.

The question box, composed of questions submitted by members, was discussed during the morning of the second day. Discussion of each of the twelve questions composing the question box resulted in a fruitful exchange of information. Among the problems discussed were vapor-locking in fuel lines, brake lining for motor coach operation, noiseless devices on street cars, waste and oil reclamation, relative merits of bronze axle bearings and iron babbitted bearings, and leaking car roofs. Following the luncheon, many of those in attendance accepted the invitation of T. W. Madison to inspect the Norfolk shops of the Virginia Electric & Power Company. After the inspection, the group was conducted on a sightseeing tour through the government naval base and about Norfolk.

By a unanimous vote, the members accepted the invitation of H. W. McCarthy and R. D. Voshall to hold the next spring meeting in Washington, D. C., on May 14 and 15.

Niagara Falls Fare Increase Agreement Sustained

The Appellate Division of the Supreme Court has unanimously affirmed the order of Justice Staley in the Supreme Court denying an application to restrain the Public Service Commission, the International Railway and the city from entering into a contract for increased fares on local lines of the International Railway in Niagara Falls presaged on a liberal program of improvements.

Under an agreement between the railway and the city, the company was allowed to increase its fare from 5 cents to 8 cents on the basis of two tokens for 15 cents. Labor organizations in Niagara Falls carried the case to the Supreme Court which ruled in favor of the city and the railway. This decision has now been upheld by the appellate division. The order of prohibition was sought on the basis that the City Council should have submitted the proposal to a referendum. It also was alleged the Mayor was not legally entitled to vote to award a contract for increased fares.

The adjustment in Niagara Falls was the subject of review in the JOURNAL for August, page 543.



Replica of Chicago grip car pulling trailer

"Old Times" Recalled by Museum Gift of Late L. A. Busby

Part of the exhibit promised by the late Leonard A. Busby, president and director of the Chicago City Railway, to the Museum of Science and Industry, Chicago, founded by Julius Rosenwald, has been completed and will be installed in the transportation division of the Museum when it opens its doors to the public in 1932.

The exhibit will trace the development of urban transportation from its beginnings to the present day. It will, of course, start with the horse car. During the past year a replica of a horse-drawn car has been completed at the shops of the Chicago Surface Lines at 78th Street and Vincennes Avenue. It is completely and faithfully reproduced, from the kerosene headlight to the stove-pipe on the roof. Even the slot has been installed in which the fares were dropped and so rolled down an inclined plane along the length of the car into the fare box just behind the driver.

Another contribution is a replica of a cable-grip car and a trailer which ran on State Street in Chicago.

When Mr. Busby decided to build this exhibit he turned the matter over to Don McGill, superintendent of the shops of the Chicago Surface Lines. Mr. McGill's search for drawings of these old cars proved futile. Finally a photostatic copy of a grip car and train was secured from the Chicago Historical Society. Next there was an "old timers'" conference. Several men in the shops who had repaired cable cars prior to the advent of the electric car made pencil sketches from memory, and point by point the details were worked out. Some one recalled that the bell that had formerly hung about the horse's neck had been transferred to the axle of the cable car. Another remembered that the glass used in the monitor sash was known as "ruby glass" and that on it the words "State Street" were etched. A firm was found and the glass was made. Since horses were used to shunt the cable car from one track to another and to move it into the carhouse, the hooks to which the horses were harnessed were also included in the replica. A huge oil lamp had to be found and the proper kind of carpet to upholster the interior was the subject of another search by Mr. McGill.



An interior view through trailer to grip car



Type of car that ran on Archer Avenue

When both cars were finished Mr. McGill started on his final quest. A horse car is incomplete without a horse, and so, Chicago and its environs were combed to find a horse that would do justice to the exhibit. A papier maché horse was secured, measured for a set of new harness and now awaits installation in a niche in the transportation division of the Museum of Science and Industry.

The accompanying photographs made by its department of photography are reproduced by courtesy of the Museum.

Study of Indianapolis Proposal Planned

Directors of the Indianapolis Chamber of Commerce have announced that its civic affairs committee will inquire into the facts relating to the future operation of local transportation facilities in Indianapolis as involved in the proposed plan of reorganization and refinancing of the Indianapolis Street Railway.

This committee intends to study the recent reorganization proposals, and to inquire into the manner in which service-at-cost franchises have operated in other cities, the rates of fare prevailing in other cities, costs of operation, character of service and other features enlightening to local consideration of the plans. The findings of the committee will be made public.



This year's Christmas posters of A.E.R.A. are different

Model San Francisco Car Used in Franchise Campaign

One of the latest model "California Comfort Cars," built in the shops of the Market Street Railway, San Francisco, was used for advertising purposes during the election campaign for a 25-year operating permit for the privately owned companies. The measure was No. 35 on the ballot. The accompanying illustration shows some of the uses the new car was put. Now that the voters have approved the granting of the permit, the company plans to start immediate production of 100 of these new



San Francisco car an effective campaign appeal

cars. This new car is 3½ tons lighter than any previously produced by the company. Gears are leaded to reduce noise and gear boxes are insulated with a special sound deadener, which is also placed under the flooring of the car for its entire length.

Trolley Buses Included in New Springfield Proposal

At a conference held on Nov. 21 between city officials of Springfield, Ohio, and executives of the Cincinnati & Lake Erie Railroad, H. C. Donecker, vice-president, presented the outline of a transportation system practically equivalent to that now in operation which contemplates retention of the present rate of fare for an indefinite period. The new proposal includes the elimination of two minor divisions which have been operating at a loss, the part time operation of trolley buses on two other lines, and increases of service and headway on four other divisions which have been making a profit.

The tentative plan of routing met with the approval of Clyde E. Wallingford, city manager, and the five city commissioners, who also approved the retention of the present rate of fare. The company is seeking a new grant and has been invited by the city to submit a tentative franchise embodying the routes suggested and other details. City officials want to conclude the negotiations in order to proceed with paving.

FOREIGN NEWS

British Borough To Test Two Types of Trolley Bus

The County Borough of Walsall, England, has decided to install a trolley bus system at an estimated cost of $33,910. Service will be started with four trolley buses of two different types. Two of these will be A.E.C.-English Electric double-deck, low-loading buses driven by direct-current 80-hp. engines, and equipped with Westinghouse brakes, while the other two will be Guy trolley buses equipped with motors of the regenerative type.

The object of ordering two vehicles of each kind is to enable the corporation, if and when it decides to extend its trolley bus operations, to choose between these two types of machines.

Details of the A.E.C.-English Electric model indicate that the most distinctive feature of its design is the placing of the motor in front of the chassis so that practically the whole of the electrical equipment is centralized in or close to the driver's cab. Ease of access is insured by a removable louvre panel.

British Transport Minister Modifies Public Control Idea

At a staff dinner of the London Underground Railway combine recently, Herbert Morrison dealt with the Government's plans regarding London passenger transport. Mr. Morrison said that suitable measures would be included in the London traffic co-ordination scheme to secure fair treatment for the officers and employees of the undertakings to be taken over by the public body. He said:

The old idea of the provision of London traffic facilities is to leave it to individual competitive undertakings to find out public needs and, if meeting these needs is thought to be a profitable enterprise, to enter the field. It was also thought sound that if other private undertakings also started services in competition this meant plenty of transport and lower fares. We have now come to realize, particularly in cases like the Greater London area, that it is necessary to regard passenger transport as a whole, to see that the service is adequate and effective to meet public needs, and at the same time to avoid the provision of wasteful services and commercial failure.

Despite the measure of consolidation which now exists in London passenger transport, there is plenty of room for further co-ordination. The choice really lies between a huge private monopoly and some form of co-ordinated public service. In the important negotiations on which I am entering I have every hope of securing the good will not only of the general public, but of those private and public undertakings engaged in providing passenger services in Greater London.

Trolley Bus for Lancashire

In Lancashire, the South Lancashire Transport Company is planning a course of future expansion different from that which will probably be followed in Liverpool. This company, which operates a widespread system over a densely populated area, has begun a change-over to the trolley bus, chosen in preference to a bus service—the medium hitherto adopted by the majority of municipalities and railway undertakings which have had cause to change their method of transport.

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Johannesburg, South Africa — The general manager of the Johannesburg Municipal Electricity Department has prepared a report which recommends the use of trolley buses in certain sections of the city. It is suggested that expenditures on the tramway system be reduced to a minimum and that, where possible, the trolley bus be used. The system now consists of 84 miles of permanent way, with 198 cars. The total capital expenditure on the system, as of June 30, 1929, was £1,379,121. At present 38 gasoline buses are run.

Christmas Shopping Pass for 75 Cents in Milwaukee

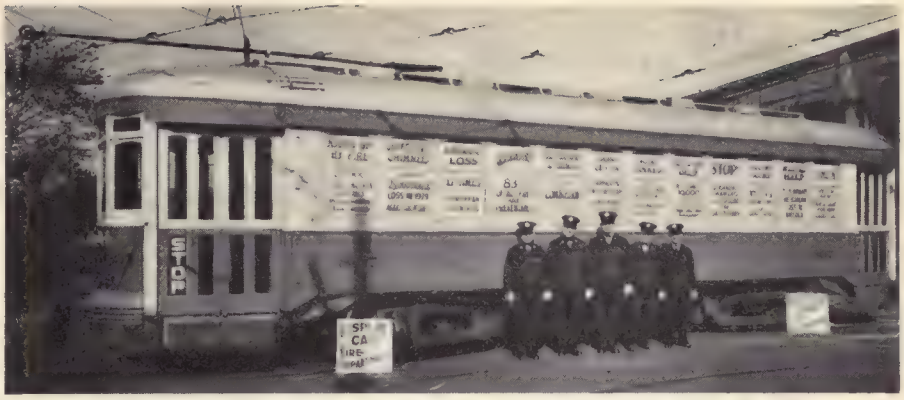
To stimulate Christmas shopping and to encourage riding during non-rush hours, the Milwaukee Electric Railway & Light Company will sell a special Christmas shoppers' weekly pass for 75 cents. The new pass will be valid on all street car and auxiliary bus lines in the single fare area and will be transferable. It will supplement the unlimited $1 weekly pass. The special pass will be in effect for five weeks, beginning Nov. 30. It will be good at all timse except between 5 a.m. and 9 a.m. weekdays, between 4 p.m. and 7 p.m. weekdays, and between 5 a.m. and 9 a.m. Saturdays. It will be good all Saturday afternoon and evening, and all day on Sundays and holidays. President Way said:

> We believe that the low fare offered during the holiday season by means of the Christmas special pass will stimulate shopping and tend to hasen the return of normal business conditions. We also hope it will increase street car riding in the non-rush periods and contribute to the relief of peak hour traffic congestion. During the holiday shopping period the riding by shoppers tends to overlap the riding of office and industrial workers. This results in inconvenience and delays to all users of the service.

Passes will be available for purchase on street cars and buses. They will also be available at the company offices and car stations, and at the Boston store, Gimbel's and the three Schuster stores. Use of the special pass will be discontinued automatically after Jan. 3.

New York Substitution Plea Amended

The New York City Omnibus Corporation, subsidiary of New York Railways Corporation, has filed with the Board of Estimate a supplement to its original application for franchises to operate buses on seven crosstown lines, asking for franchises to operate nine more lines in the Borough of Manhattan. The plan amounts to motorization of the entire New York Railways system. The application proposes that on all but two lines, the company will charge a 5-cent fare. The other two lines, are divided into two 5-cent zones. A charge of 2 cents will be made for transfer at intersections.



Fire prevention car with members of local fire department in charge

Fire Prevention Demonstration at Harrisburg by Trolley Car

"Fire Prevention Week" at Harrisburg, Pa., meant more to the Harrisburg Railways than mild participation on its part in the event. And the accompanying illustrations substantiate this statement. Through a car offered to the local fire department for display purposes and through the co-operation of that department, local Chamber of Commerce, Pennsylvania Power & Light Company and the Harrisburg Gas Company, together with the district officers of the Fire Underwriters Association the exposition program was brought to the attention of the people of Harrisburg and surrounding towns.

The car was on display in what is known as Market Square, Harrisburg, daily, from 11 a.m. to 1:30 p.m. and from 5 p.m. to 10 p.m., and at such times was in charge of assigned members of the Harrisburg fire department who conducted visitors through the car and explained the various displays.

During the week, and at times when not on display at Market Square, the car was routed to the outlying communities as well as the various schools and at each of these points the attendance was quite large. The method of display received a considerable amount of favorable comment from the local newspapers. Fire department records showed nearly 15,000 people boarded the car and examined the various displays. These consisted of numerous exhibits of electrical equipment of a fire-hazard type, modern methods of electrical installation, obsolete and modern fire prevention equipment, hazardous and safe brick chimney construction, modern fire alarm boxes and other features designed to educate the public in fire prevention. One of the modern fire alarm boxes being installed throughout the city was so hooked up with a fire gong in the car that actual demontrations were made for the benefit of visitors to show how to turn in an alarm in case of a fire.

Timely Tax Text

Under the title "The Tax that Breaks the Street Car's Back," Leslie Vickers, economist American Electric Railway Association, has contributed a timely analysis of street railway taxation to the Nov. 27 issue of *Public Utilities Fortnightly.* To street railway operators the fact that their properties are loaded with tax burdens, is no secret. The general public, however, knows little of the situation. Mr. Vickers' article helps to throw light upon this.



General interior view showing modern and obsolete fire prevention equipment



Booths contrasting hazardous and safe ways of installing electrical equipment

PERSONAL MENTION

Segregation of Ohio Rail and Bus Lines Announced

Messrs. Sammis, See and Graham Appointed to Chief Executive and Operating Posts With Transportation Securities Corporation, Successor to Transportation Lines of Ohio Edison Company

A. C. BLINN, vice-president and general manager of Ohio Edison Company, announced on Nov. 15 that Ohio Edison Company had sold all of the common stock of Akron Transportation Company, Northern Ohio Interurban Company, Canton Traction Company and the Cleveland-Akron-Canton Bus Company to Transportation Securities Corporation. By this sale, Ohio Edison disposes of its entire interests in the transportation business and hereafter will be engaged exclusively in the electric and steam heating business. Mr. Blinn and L. G. Tighe, vice-president and Akron Division manager of Ohio



W. H. Sammis

Edison Company, who have been officers of the transportation companies, retire as such and neither they nor any of the employees of Ohio Edison Company as now constituted will hereafter have any connection with the transportation business.

Transportation Securities Corporation is headed by W. H. Sammis, New York, as president; R. N. Graham, Youngstown, as vice-president; P. V. C. See, Akron, vice-president and general manager; J. B. Waring, Akron, is secretary and treasurer, and W. O. Zehm, Akron, auditor. In addition to Messrs. Sammis, Graham and See, the directors are D. A. Scanlon, formerly general superintendent of railways of Northern Ohio Power & Light Company, as transportation superintendent; W. J. Ruof, vice-president Central-Depositors Savings & Trust Company; W. A. M. Vaughan, vice-president of the First-City Trust & Savings Bank, and E. A. Oberlin, president Firestone Trust & Savings Bank, all of Akron.

Mr. Sammis has recently been connected in New York with the Commonwealth & Southern interests, which control the systems in Ohio. Among his other work there he has been assistant to T. A. Kenney, vice-president of the Allied Power & Light Corporation. He was at one time with the Consumers Power Company in Michigan. Also for a time he was an instructor in electrical engineering in Columbia University. He joined the power staff of the Charles H. Tenney Company in 1924, but previous to that he had been connected with the Public Service Electric Company and the Brooklyn Rapid Transit System. From 1917 until the fall of 1929 he was in the United States Naval service. He was graduated from Columbia and has written frequently on technical subjects, notably a treatise on aircraft ignition equipment.

Operating Officials of Wide Experience

Mr. See has been engaged in the transportation business for many years. He is a graduate of Armour Institute of Technology from which he later received an advanced degree in electrical engineering. He had his early training as car building inspector and foreman with the Chicago Elevated Railways. He was also general foreman for the Twin City Rapid Transit Company, St. Paul, Minn. He next became general foreman for the Illinois Traction System at Decatur, Ill. Mr. See next went to New York and for eleven years was superintendent of equipment for the Hudson & Manhattan Railroad operating between New York and New Jersey. His experience has thus covered every phase of transportation—city and interurban, elevated and subway cars, buses, truck and automobiles. At present he is first vice-president of the American Electric Railway Engineering Association. He has been active in the work of the master mechanics group affiliated with the Central Electric Railway Association, as well as the national association.



R. N. Graham

He is now and has been a member of the transportation and maintenance committee of the Society of Automotive Engineers. He has been engaged in transportation work in Akron for the last ten years as superintendent of rolling stock and equipment.

Like Mr. See, Mr. Graham has made many notable contributions to the art of mass transportation. He has been a frequent contributor to the technical press, and his papers and discussions before national and sectional associations have been especially welcome for the wealth of information they have contained. He played his part in securing the award of the Coffin medal to the Penn-Ohio system and scored again last year in the winning of that award by the Youngstown Municipal Railway. He is a lawyer turned railway man, going to Youngstown in 1917 to manage the railways of the Mahoning & Shenango Railway & Light Company. He was born in Jackson, Mich., in 1877, and was graduated from the University of Arkansas with the class of 1898. He then practiced law in Joplin, Mo., until 1908, and during this time served as a member of the Missouri Legislature from the Joplin district. Mr. Graham entered the electric railway field through a connection of several years with the legal department of the Houston Electric



P. V. C. See

Company and the Galveston-Houston Electric Railway, Houston, Tex. In 1916 he was made assistant manager of railways of the Mahoning & Shenango system in charge of the railway properties. While Mr. Graham practiced before the bar his work in Missouri, Kansas, Oklahoma and Texas dealt largely with municipal and corporation problems.

D. A. Scanlon has been general superintendent of railways for many years for the Northern Ohio Power & Light Company. He has been retained by the new transportation organization as superintendent.

Transportation Securities Corporation, the purchaser of the stock ownership of the transportation companies sold by Ohio Edison Company, is a holding company which now owns the common stock of the street and interurban railway and motor bus companies operating in Youngstown and other communities in eastern Ohio and western Pennsylvania.

The plan of organization of the Ohio Edison Company and a statement of its personnel were the subject of review in Electric Railway Journal for August, 1930, page 545.

Railway Official Heads West Virginia Operators

C. H. Hardesty, recently elected president of the Public Utility Association of West Virginia, is vice-president of the Monongahela-West Penn Public Service Company in charge of generation, distribution and sale of electricity for the company, which now furnishes various types of public utility services in 27 counties in northern West Virginia; Washington and Noble Counties, Ohio; Garrett County, Md., and Fayette County, Pa.

Mr. Hardesty has literally come up from the ranks. Having worked in numerous departments on several divisions, Vice-President Hardesty has a wide acquaintance among employees. Outside the company, too, he is known as one of the able utility executives of the country, and at present is president of the East Central division of the National Electric Light Association, which includes the states of West Virginia, Ohio and Kentucky.

Mr. Hardesty was born in Marion County, and after he was graduated from West Virginia University he was employed by the Western Maryland Railroad from 1915 to 1917. His first work with the company was in the purchasing department where he started Dec. 27, 1917. He was appointed superintendent of the Clarksburg division on May 1, 1920. Other



C. H. Hardesty

positions he has held include traveling freight and passenger agent, general traffic manager, manager of the Parkersburg and Marietta division, and assistant to the president. Mr. Hardesty was appointed vice-president in charge of electrical production and sales on Feb. 6, 1929.

Twenty Year Club Has Distinguished Member

Honorary membership in the Twenty Year Club of the Indianapolis Street Railway has been conferred upon Louis Ludlow, representative in Congress from the Seventh Indiana district. Mr. Ludlow was in newspaper work and was political correspondent at Washington for numerous publications prior to his election to the House of Representatives. As the principal speaker at the club's annual dinner and meeting, he related humorous incidents in his early experience with the railway and its employees while he was in newspaper work in Indianapolis twenty years ago. Beck Lowe, an employee in the shops department, received a testimonial belt awarded each year to the employee with the best service record. He has been employed by the company for 50 years.

New Jersey Railway Operating Officials Are Advanced

Philip F. Maguire Made Superintendent Maintenance of Way in Transport—Thomas P. Burke Becomes Manager and George Klement Assistant in Central Division



P. F. Maguire

ANNOUNCEMENT has been made by Vice-President Matthew R. Boylan, Public Service Co-ordinated Transport, Newark, N. J., of the appointment of Philip F. Maguire to be superintendent of maintenance of way, to succeed the late Martin White. Mr. Maguire, who has been manager in the central division, will be succeeded in that position by Thomas P. Burke, formerly assistant manager. George Klement has been named assistant manager in the central division.

Mr. Maguire has been central division manager since November, 1925, and superintendent of that division for six years prior to 1925. He has been in the continuous employ of Public Service and predecessor companies more than 34 years. He has risen, step by step, to his new position from the platform of a street car, for in August, 1896, he started with the Plainfield Street Railway as a conductor. In 1899 he was promoted to inspector at Plainfield, and in 1903 was made supervisor in charge of the Union line, Plainfield lines and the Rahway line. To familiarize himself with the work of the department of which he now becomes superintendent, Mr. Maguire was transferred to the maintenance of way department in April, 1906, and became assistant superintendent of that department in 1915. He



T. P. Burke

remained there until 1919, when he was promoted to superintendent of the central division.

Mr. Burke has held various positions in transport work with Public Service and was stationed in Perth Amboy, Westfield, Plainfield, New Brunswick and Newark. He began his career in transportation work in 1894, at Bridgeport, Conn., in the employ of the Radel Brothers, who also owned the Middlesex & Somerset Traction Company in New Jersey to which they transferred him in 1900, as an inspector at Bound Brook. When Public Service acquired the Raritan Traction Company in 1904, Mr. Burke was sent to Perth Amboy to take charge. In 1905 he was appointed supervisor in charge of Plainfield and Westfield lines. In 1906 he was appointed supervisor of all lines operating out of New Brunswick, where he remained until



G. Klement

1918, when he left Public Service to take another position. In 1925 he returned to Public Service and was assigned to Essex division. He was supervisor at Miller Street carhouse and Sherman Avenue garage in Newark just prior to his promotion in March, 1927, to assistant manager of central division, one of the system's largest.

Mr. Klement began his association with Public Service in April, 1915, as a conductor at Miller Street carhouse. He then served for two years on the "Fast Line," operating between Newark and Trenton. He was appointed stationmaster at Miller Street in 1919, and held this position for seven years. In 1926 he became road supervisor at Central Avenue carhouse, later holding a similar position at Big Tree, Roseville and Hilton carhouses. He has recently been Bloomfield district superintendent, Essex division.

Raymond S. Tompkins, assistant to the president of the United Railways & Electric Company, Baltimore, has been elected to the board of directors of the Better Business Bureau of the Advertising Club of Baltimore.

Honolulu Official in Elective City Office

Leroy C. Bush, chief engineer of the Honolulu Rapid Transit Company, Ltd., Honolulu, Hawaii, was elected a member of the board of supervisors of the city and county of Honolulu at the general election on Nov. 4. This was Mr. Bush's first attempt at politics. He not only lead the Republican ticket in the primary election, but received more votes than any of the many other candidates in the general election. As the supervisors in Honolulu devote only part time to city work, the election will in no way interfere with his duties with the local railway. He will be chairman of the important public works committee of the supervisors.

Mr. Bush entered the employ of the Honolulu Rapid Transit Company in April, 1922, as assistant engineer in the maintenance of way department. His promotion with the company was rapid. He assumed his present position in February, 1928. He was born in Honolulu on Dec. 1, 1897, and attended public schools there. In 1920, he was graduated from the University of California with a degree in mechanical engineering. After taking the student engineers' course at the Allis-Chalmers plant in Milwaukee he returned to Hawaii.

G. R. Green Vice-President as Well as Manager

George R. Green, general manager of the Northern Indiana Railways, Inc., South Bend, has been elected vice-president of the organization. He succeeds Harry Wair, South Bend attorney, who recently died.

Two new directors have also been elected. They are Arthur L. Hubbard, president of the First National Bank, South Bend, and Allison E. Stuart, Lafayette, Ind. Mr. Hubbard fills the place on the board of directors left vacant by the death of Mr. Wair, and Mr. Stuart occupies a position that has not been filled since the corporation was reorganized last year.

The board of directors of the Northern Indiana Railways, Inc., now consists, in addition to Mr. Hubbard and Mr. Stuart, of Alfred P. Dietrich, New York City; A. H. Plumb, Emporia, Kan.; R. R. Smith, South Bend; Alva Kitselman, Muncie, Ind.; and W. C. Ewen, New York City.

The officers are Mr. Smith, president; Mr. Green, vice-president and general manager, and O. A. Small, secretary-treasurer.

Herbert C. Lummis Retained in Washington

Services of Herbert C. Lummis, an engineer of wide experience on many properties in different parts of the country, have been retained by the Capital Traction Company, Washington, D. C., in connection with the valuation of its property now being made by order of the local Public Utilities Commission. Mr. Lummis has already taken over his new duties and will have charge of this work under President J. H. Hanna.

For six years Mr. Lummis was staff engineer of the board of supervising engineers in Chicago, which has supervision over the surface lines of that city. Recently he has been engaged as a consultant in valuation and rate cases, rapid transit routes and leasing street railway routing, etc. in Philadelphia, New York, Montreal, Washington and Buffalo.

Mr. Lummis was born in Georgia, educated in the public schools and received his degree in Civil Engineering in 1912 from the University of Colorado. After he was graduated, his first connection was with Bion J. Arnold, Chicago. He was an assistant engineer in the study of the transportation facilities of San Francisco in 1913 made for the city by Mr. Arnold.

While on the Arnold staff Mr. Lummis made reports on routings, rapid transit plans, entered into financial and accounting studies and engaged in other urban transportation work of similar character in most of the large cities of the country. He was principal assistant engineer in the valuations of the surface system of the Brooklyn Rapid Transit Company. He also had charge of the valuation of the Aurora, Elgin & Chicago Railway in 1919.

Tudor W. Jones, auditor of the Indiana Railroad, Anderson, Ind., formerly the Union Traction Company of Indiana, has resigned his position. He was connected with the Union Traction Company for 25 years, having started as ticket agent at Anderson in 1905. For the past nine years he has been auditor of the company. Mr. Jones expects to devote his attention to other interests after a brief vacation. No successor has been named to fill the position.

A. J. Lundberg Heads Revamped Oakland Transportation System



A. J. Lundberg

A. J. LUNDBERG, who heads the reorganized Key System Transit, Oakland, Cal., entered that company as a representative of banking interests when the affairs of the railway seemed darkest several years ago. His announced intention was to restore the company's credit and put its securities on a sound basis. That task proved insuperable without reorganization, and the readjustment was carried out recently. In some respects it has been drastic but no more so that the changed economic conditions under which the company is now forced to operate seemed to make desirable. As a result there has been evolved the East Bay Street Railways operating the street railway lines, the East Bay Motor Coach Lines operating the bus lines, the Key System operating the transbay service and the Key Terminal Railway operating the ferry services. Stock of these companies is held by the Railway Equipment & Realty Company, with Mr. Lundberg at its head, as he is of the subsidiary companies, except the Terminal Company.

As just indicated, Mr. Lundberg took over the administration of the old transit company when it was in a precarious financial condition. He headed a new management that represented in many respects a complete change in company policies. The reorganization of the old Key's tangled affairs could not be avoided, but the readjustment was unusual in many respects. In spite of its size and the number of security holders involved, the costs of the readjustment were low. The members of the readjustment committee, without compensation, assumed the responsibility involved and devoted their time to the many meetings and discussions. Due to the co-operation of many financial institutions, no expenditure was incurred for the solicitation of security holders other than the preparation and mailing of literature. Under the plan which was finally put into effect, the funded debt of the old transit company was reduced from $20,000,000 to $4,500,000, all of which is in the form of equipment trust certificates.

Although primarily a banker, Mr. Lundberg brought to the Key System an uncanny sense of values. He was keenly alive to the economic changes in transportation, and he and his associates left no stones unturned, so far as it was possible, to merchandise the service. But he didn't overlook economies. He faced the problems firmly as they arose and when the time came for financial readjustment he was just as thorough in his housecleaning as he had been in his efforts to rehabilitate the property physically and from the point of selling the service more intensively.

Primarily a Banker

Mr. Lundberg's first business connection was with the Bank of San Francisco, which later was absorbed by the Bank of Italy. He entered the employ of the bank in 1909, and in 1910 became an employee of the state banking department under Alden Anderson, superintendent of banks. A year later he became secretary to Herbert Fleischhacker of the Anglo and London Paris National Bank in San Francisco, remaining in that capacity until 1912. In the latter year he accepted a clerkship in the brokerage firm of J. Barth & Company in San Francisco, becoming a partner in that concern in 1926.

Mr. Lundberg was born in San Francisco. He received his education in the public schools of his native city. He was the first president of the San Francisco Stock and Bond Exchange.

Col. R. H. James Indiana Operating Executive

Col. Ralph H. James, vice-president of the Chicago, South Shore & South Bend Railroad and Chicago, North Shore & Milwaukee Railroad, has been elected vice-president in charge of traffic of the Indiana Railroad. Robert M. Feustel, president of the Indiana Railroad, made the announcement. Mr. Feustel also announced the election of William J. Knorst as assistant vice-president, and Edwin J. Booth, as assistant to the president.

As vice-president in charge of traffic of the Indiana Railroad, which formerly was the Union Traction Company of Indiana, Colonel James will be chief traffic executive of the entire Indiana Railroad System. He will be assisted by Mr. Knorst.

The Indiana Railroad System includes the electric interurban railway lines of the Indiana Railroad, Interstate Public Service Company, Indiana Service Corporation and Northern Indiana Power Company, comprising a total of more than 700 miles of track.

Colonel James served in the World War as an officer in the British army.

J. C. McPherson in New Southern Pacific Post

J. C. McPherson, for the past eight years superintendent of the East Bay electric division of the Southern Pacific Company, has been made general representative of the organization with headquarters in Oakland, Cal. This appointment followed the consolidation of the East Bay Electric and Western divisions of the Southern Pacific. He will represent the operating department in public relations in the East Bay cities and have charge of the company's real estate in Alameda and Contra Costa Counties.

Mr. McPherson entered the employ of the Pacific Electric Railway at Los Angeles in 1895 as a conductor, and advanced until he became superintendent of the northern division of the electric system. In 1913 he was appointed to take charge of the Oakland, Berkeley and Alameda electric lines. Following the war, he returned to the Pacific Electric in 1919 as assistant general superintendent, which position he held until he again took charge of the East Bay electric lines in 1922.

English Editor Appreciative of American Courtesies

Horace Wyatt, director of *Bus and Coach* and *Motor Transport*, published in London, England, has returned home after a visit of more than six weeks in the United States and Canada. Mr. Wyatt came here primarily to attend the International Road Congress in Washington, but, at the conclusion of the sessions of the Congress, he traveled in the East and the Central West to study bus and truck operation. He was a particularly interested observer at the meeting of the transportation section of the Society of Automotive Engineers held in Pittsburgh.

In England the problem of the competition of the private car with the mass transportation agencies is not so acute as it is here, and, as yet, the problem of the parked car has not manifested itself there to anything like the same degree. However, Mr. Wyatt feels that his visit to the United States and Canada has greatly increased his understanding of these problems just as it has his realization of the problem of the pirate taxi.

During his stay, Mr. Wyatt interviewed, among others, many electric railway operators. In discussing his trip with a representative of ELECTRIC RAILWAY JOURNAL, he expressed his appreciation of the many courtesies extended to him here, stressing particularly the degree of candor with which executive officers and officials discussed operating and engineering problems with which they are confronted.

Consulting Engineering Office Opened by A. H. Armstrong

A. H. Armstrong, assistant engineer of the railway department of the General Electric Company for many years, and more recently chairman of the railroad electrification committee, and consulting engineer for the transportation department, has established a private consulting engineering office at 16 Troy Road, Schenectady, N. Y.



A. H. Armstrong

An outstanding authority on electric traction in the United States, he has contributed much fundamental information to textbooks on this subject, as well as exhaustive papers before various technical societies. His numerous studies of railroad electrification projects and, more particularly, his intimate connection with such electrification work as the Chicago, Milwaukee, St. Paul & Pacific, the Butte, Anaconda & Pacific, the New York Central, and other well-known electrifications, have especially qualified him for the consulting work which he is now entering upon in connection with railroad electrification.

Mr. Armstrong was graduated from Worcester Polytechnic Institute in 1891. He entered the employ of the Thomson-Houston Company at Lynn, Mass., in the same year. He joined the railway engineering department of the General Electric Company in 1897, and since that time has devoted most of his energies to the study of railroad problems.

He is a member of the American Institute of Electrical Engineers, the National Electric Light Association, the American Electric Railway Association, the American Railway Engineering Association, and other societies.

George Wright in Charge of Toronto Garages

George Wright, for the past ten years material superintendent of the way department of the Toronto Transportation Commission, Toronto, Ont., has been made superintendent of the garage department. Mr. Wright was born in Halifax, N. S. He was graduated from the Faculty of Applied Science of the University of Toronto in 1907. He spent a year on the staff of the University, a year with the Canadian Northern Railway, three years as assistant engineer of maintenance of way with the Grand Trunk Railway, three years in the City of Toronto Works Department, two years supervising construction with the Warren Paving Company, one year deputy engineer of London, Ontario, three years as city engineer of London. He also served as field engineer on plans in taking over the Toronto Street Railway, after which he spent two years with the department of highways in charge of Eastern Ontario work. Leaving the highways department, he worked in 1920 on the valuation of the property of the Toronto Railway, later taken over by the city, and was then appointed material superintendent of the T.T.C.

W. H. Swift, Jr., at Springfield

William H. Swift, Jr., for four years manager of the New Brunswick Power Company, with 25 miles of electric railway in St. John, N. B., and suburbs, has assumed his duties as manager of the Springfield Gas & Electric Company and the Springfield Traction Company, Springfield, Mo., succeeding A. E. Reynolds, transferred to St. John.

At the time of his departure from St. John, Mr. Swift was tendered a farewell banquet in the Union Club, St. John, attended by 100 men. During the dinner, he was presented a silver cigar and cigarette container, engraved with these words: "William H. Swift, Jr.—from friends and business associates in Saint John, N. B., Canada, Oct. 29, 1930." The presentation was made by the Mayor. There were speeches by the Mayor, Premier of the Province, W. S. Fisher, a member of the board of directors of the New Brunswick Power Company, and by Mr. Swift, and his successor, Mr. Reynolds, Mr. Swift having remained to introduce Mr. Reynolds.

Another Decoration for Arthur Gaboury

The Government of the French Republic has bestowed on Arthur Gaboury, secretary-general of the Province of Quebec Safety League, Montreal, the decoration of "Officier de l'Instruction Publique." This is the second decoration awarded Mr. Gaboury, for in 1918 the French Republic on the recommendation of the "Union Nationale Francaise" of Montreal bestowed on him the "Palmes Académique" for the excellent services rendered by him in the promoting and furthering the cause of French Canada. Moreover, in July, 1908, the "Union Nationale Francaise" presented him with a gold medal as a testimonial to the work done and service rendered to the French cause.

Arthur Gaboury is known throughout

the Province of Quebec as the safety standard bearer. As secretary-general of the Province of Quebec Safety League his word on all matters appertaining to safety measures is accepted as final. Created in 1923, the Safety League has grown to an organization covering practically every industrial firm of note in the Province.

Mr. Gaboury entered business with the Montreal Tramways on June 6, 1893, finally becoming head of the claims department. The year 1914 saw the birth of a campaign of accident prevention, a movement that was actually the foundation of what is now known as the Province of Quebec Safety League, organized by Mr. Gaboury when he left the Montreal Tramways. For 1920-1921, Mr. Gaboury was president of the Canadian Electric Railway Association. He also served as a member of the executive committee and Canadian representative of the American Electric Railway Association.

B. C. Palmer Represents Ohmer in Chicago

Complete charge of the Chicago branch of the Ohmer Fare Register Company has been assumed by B. C. Palmer, special sales engineer for that firm since 1927. In addition to supervising the business offices there, and continuing in his capacity of general sales manager for the company's taximeters, cash registers, and recording devices, Mr. Palmer will direct Ohmer activities over a large surrounding territory of eight states.

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A. C. Moorhaus, purchasing agent of the Union Gas & Electric Company, Cincinnati, Ohio, since 1924, has been made acting general manager of the company. Mr. Moorhaus became affiliated with the Union Gas & Electric Company six years ago, after resigning as secretary of the Scioto Valley Railway & Power Company, Columbus. W. R. Freeman, assistant to Mr. Moorhaus since March of this year, becomes acting purchasing agent of the Union Gas & Electric Company.

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Roy V. Wright, of New York, managing editor of *Railway Age,* has been elected president of the American Society of Mechanical Engineers for 1931. Mr. Wright succeeds Charles Piez, of Chicago. He will be installed at the annual meeting in New York Dec. 1-5. Mr. Wright is a graduate of the University of Minnesota. He has been in railway mechanical work for 32 years.

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T. Justin Moore, vice-president and general counsel for the Virginia Electric & Power Company, Richmond, Va., was elected president of the Virginia Public Utilities Association at the closing session of the fifth annual convention of the organization at Virginia Beach, Va., on Nov. 14.

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Neill W. Funk, safety director and head of the claims department of the Louisville Railway, Louisville, Ky., who has served several short terms under appointment as police judge of Louisville, recently accepted another appointment for relief duty, but has announced that his judgeship salary would all go to charity.

OBITUARY

Martin White

Martin White, superintendent maintenance of way Public Service Co-ordinated Transport, Newark, N. J., died on Oct. 25. Mr. White began his connection with street railway work some 37 years ago when he took a position as track foreman with the Rapid Transit Street Railway, a predecessor company of Public Service. Since that time he was continuously in the company's employ, achieving the unusual record of holding the position of superintendent of maintenance of way for almost a quarter of a century.

Mr. White was thoroughly versed in the transportation business with which he had been identified many years, and in electric railway circles throughout the country he was known as an expert in the maintenance of way field. Matthew R. Boylan, vice-president in charge of operation, paid tribute in *Public Service News,* company publication, to Mr. White as a close friend and valued counselor over a long period of time and through many struggles. Mr. Boylan said that "he was a true gentleman, in the best sense of that term—product of a school which is rapidly vanishing. His honesty, loyalty and genial nature commanded a host of friends, none of whom will miss him more than we, his Public Service associates."



Martin White

Mr. White's skill and ability in all matters pertaining to maintenance of way work soon brought him into wide prominence in engineering circles in New Jersey. He was the first to suggest the use of clipped stone block in paving between rails and he contributed many valuable suggestions to the makers of special track work at intersections and railroad crossings.

Born in County Galway, Ireland, in 1859, Mr. White came to this country when he was sixteen years old. Prior to his association with the Rapid Transit Street Railway he worked for some time in the maintenance of way department of the Pennsylvania Railroad.

✦

W. E. Davis

William E. Davis, 67, prominent electrical engineer, died at Cleveland, Ohio, recently. He took a leading part in the building of street railway lines in Toronto, Canada, in the early 1890's and the Lake Shore Electric Railway, in Ohio. He became light and heat commissioner for Cleveland, and in 1923 was made chairman of the arbitration board, established to fix a rate between the municipally owned system and the Detroit United Railway covering terms for interurban cars to operate over the city tracks. For the past few years he has been consultant for the Cleveland Railway.

✦

W. S. Dimmock

W. S. Dimmock, Los Angeles, Cal., long active in the electric railway field, died recently in that city. Much of Mr. Dimmock's work had been done for Stone & Webster on their Pacific Coast properties, notably as manager of the Puget Sound Electric Railway, Pacific Traction Company and the Tacoma Railway & Power Company. Mr. Dimmock began his career in steam railroad work. After long service there he entered the electric railway business in 1892 as general manager of the Omaha & Council Bluffs Street Railway and the Omaha & Southern Railway. Later he served as general manager of the Richmond Passenger & Power Company, operating in Richmond and Petersburg, Va. It was from the Richmond properties that he went to the Pacific Coast for Stone & Webster and there became an important factor in the management of properties over which they exercised supervision. For them he continued in one capacity or another until 1910 when he was assigned to the company's Boston office. But the power of the Pacific to attract him remained unabated and he returned to the more equable climate of Southern California there to contemplate the passing show in leisure which he so well deserved.

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L. W. Miles

Lowell W. Miles, employment manager for the Interstate Public Service Company, Indiana Service Corporation and other co-ordinated utilities in Indiana under Insull management, died on Nov. 11.

Mr. Miles was born in Elwood, Ind., in 1898. After being graduated from Indiana University in 1922, he was associated in appraisal work for several years with Robert M. Feustel, a consulting engineer, now chief operating executive of the Insull companies in Indiana. He joined the Indiana Service Corporation at Fort Wayne in 1925 as manager of motor coach operations. In 1926 he was made statistician of the company and in August, 1929, he became employment manager of the co-ordinated companies at Indianapolis.

✦

H. R. Bowie

Hanson R. Bowie, auditor of the Penn-Ohio Transportation System, assistant general auditor of Ohio Edison and auditor of Pennsylvania Power Company, died recently.

Mr. Bowie was born in Uniontown, Pa., July 19, 1881. He went to Youngstown as assistant auditor of The Pennsylvania-Ohio Power & Light Company and associate companies, and was appointed auditor in April, 1928, on the resignation of F. E. Wilkin.

Throughout the period of the war, Mr. Bowie was in the cost accounting division of the Army Ordnance depart-

ment, being stationed at the Winchester Repeating Arms Company, New Haven, Conn., for the greater part of his service. Prior to the war he had been employed in the accounting departments of the Pacific Light & Power Company and the Southern California Edison Company. He was graduated from the Southwestern University of Southern California in accounting and commercial law.

✦

R. F. Clinch

R. Floyd Clinch, vice-president and a director of the Chicago, North Shore & Milwaukee Railroad and of the Chicago, Aurora & Elgin Railroad and a director of the Chicago Rapid Transit Company, died suddenly on Nov. 7 of heart disease.

In 1889 Mr. Clinch and the late John Crear organized the Crear-Clinch Coal Company, of which he was president at the time of his death. In addition to his electric railway affiliations, he was a director of the Central Trust Company, of Chicago; president of the Michigan Transit Company; of the Traverse City State Bank of Traverse City, Mich., and of the Hannah & Lay Mercantile Company; and receiver for the Chicago Auditorium Association.

Mr. Clinch was born in Georgia 65 years ago. He was educated in private schools in Georgia and later attended a military academy in Pennsylvania. He went to Chicago in 1883 and became associated with the Joliet Steel Company.

✦

T. Coleman du Pont

T. Coleman du Pont, former United States Senator from Delaware, banker, insurance man, powder manufacturer, coal miner, steel man, and street railway executive, died at Wilmington, Del., on Nov. 11. Mr. du Pont was a native of Louisville, where his family established some of the first street railways in Kentucky. Mr. du Pont was educated in Louisville schools, and at the Massachusetts Institute of Technology. His first business experience was in his father's coal mines at Central City, Ky., for the Central Coal & Iron Company, of which he later became president. In 1894 he went to Johnstown, Pa., and entered street railway work. At one time he was president of the railway in Johnstown, Pa., and controlled others in New York and New Jersey. Years ago he was instrumental in formation of the du Pont Manual Training High School in Louisville through a large donation.

✦

E. P. Charlton

E. P. Charlton, one of the original trustees of the Eastern Massachusetts Street Railway, to which post he was named by the Governor of Massachusetts in 1919, died on Nov. 20. Mr. Charlton was appointed to the board from Fall River, of which place he had long been a resident. There he served in banking, as a merchant and as a mill owner. It was his varied experience and his general appreciation of the needs of the territory served by the railway that led to his being named a railway trustee. He also served as a director of the New Haven Railroad. To industry he was, perhaps, best known as a vice-president of the F. W. Woolworth Company, with which the Charlton stores were combined in 1912. During the World War he served on the War Industries Board, at Washington, performing notable service. He later entered the War Department to aid in the purchase of supplies. He was a liberal contributor to charity.

Jacob Fishback

Jacob Fishback, 83 years old, who worked his way from a job as driver of a mule-drawn street car at Louisville, Ky., in 1869, to the position of assistant superintendent of transportation of the Louisville Railway, died on Nov. 10. He had been assistant superintendent since 1890.

Born in Somerset, Ky., Mr. Fishback received his education in the schools of Russell, Pulaski, Garrard, Boyle and Fayette Counties. He was early thrown on his own resources and worked in Lexington, Ky., for some years as a clerk. In 1869 he entered the employ of the Central Passenger Railroad in Louisville as a mule car driver. In 1872 he was made foreman of the carhouse and stables at Fifth and Oak Streets, and six years later was promoted to foreman of the railroad's carhouse at Eighteenth and Walnut Streets.

After the merger of the then existing railways of Louisville into the Louisville Railway Colonel Fishback was made assistant superintendent in charge of the car building and repair shops at Eighteenth and Walnut Streets. He was also made assistant superintendent of transportation at the same time.

✦

David W. Hennessey, general manager of the Ohio River Railway & Power Company, Pomeroy, Ohio, died at his home in Pomeroy on Nov. 18. He was 46 years of age.

Arthur W. Thompson



A. W. Thompson

Arthur W. Thompson, former president of the United Gas Improvement Company and of the Pittsburgh Railways, died on Nov. 9. His service with the United Gas Improvement Company extended from Sept. 1, 1926, until January, 1929, when he retired owing to impaired health. After an extended trip abroad he established offices in Philadelphia as a consultant.

Following long and prominent serving in the steam railroad field, Mr. Thompson entered utility work where he became well known as a sturdy force in Pittsburgh after the war, serving as president of the Philadelphia Company in that city. It was he as his associates in the railway who convinced the many communities served by that company they could furnish all classes of common carrier transportation service. Not only that but they secured a new and favorable franchise and established a point of view on the part of the public toward the company that was a most notable achievement for co-ordinated transportation. It was these accomplishments among others which made it possible for the company to come within the requirements laid down by the Coffin foundation for that contest and to be returned the winner in 1925.

For more than fourteen years before that, the Pittsburgh Railways had been at odds with the city, during which seven separate and distinct reports had been presented. They involved more than $700,000, spent by the city, the Public Service Commission and the company to ascertain a valuation. All of this work was followed by a six-year receivership. Despite their heroic work, the receivers were unable to rehabilitate the company financially and were unable to finance the purchase of equipment or to improve the property except out of earnings. Finally the Pittsburgh Railways was turned back to the owners on petition of the city and the owners, to permit a trial operation of the new agreement. It was out of this chaos that Mr. Thompson and his associates lifted the Pittsburgh Railways to heights of accomplishments in the way of physical improvement, financial betterment and public relations which won for it the highest awards within the power of the industry to bestow. And at the convention of the association in 1925, Mr. Thompson, in accepting the award, graciously bestowed the credit for the accomplishments on his associates.

To those in the electric railway industry Mr. Thompson was best known by his work at Pittsburgh. To that work he brought the experience of a career which began as a rodman while he was still in college and culminated with him a vice-president of the B. & O. Railroad. Following his graduation from the civil engineering department at Allegheny College in 1897 he started as a draftsman with Wilkins & Davison at Pittsburgh and there served the hard school of railroad apprenticeship, being drafted from one important post to another until finally he became federal manager of several railroads during the war-time period. In his last post with the Baltimore & Ohio System he was in charge of operations, traffic, engineering and commercial developments. As chief engineer he supervised the expenditure of more than $1,000,000 per month in construction work over a long period. He had charge of the construction of the 6-mile $6,000,000 Magnolia cut-off, and while chief engineer of maintenance of way, he set a world record in the removal and replacement of bridges under traffic. These facts merely hint at the record of the man's accomplishments. They do not tell the full story. Mr. Thompson was born in Erie, Pa., on May 8, 1875.



Last eight Brill trolley buses placed in service have a reduced length but retain characteristic design and construction

Latest Brill Trolley Buses Delivered to Chicago

Since the Chicago Surface Lines started its program of trolley bus installations, 21 Brill trolley buses have been delivered. The last eight to be placed in service represent the latest 40-passenger type, which are shorter than their predecessors. The all-metal body was designed to combine profitable light weight with economical sturdiness. With the higher rates of acceleration, free running speed and consequently increased braking efficiency essential to trolley bus operation, the strain upon the construction, particularly in the roof and roof supports, is naturally greater. Much consideration has been given to the design of these parts and provision made to take care of it, resulting in the adoption of wide, substantial corner-pier construction.

In the underframe chassis, framing of ample strength and flexibility is furnished, while channel side and cross members provide adequate attachment for semi-elliptic springs, motor framing and other necessary equipment. Steel angle side sills, wood filled U-shaped pressed-steel side posts and carlines, side sheathing below the windows of No. 16 copper bearing steel securely riveted to adjacent members, No. 16 gauge pressed-steel letterboards and No. 18 gauge steel wheelhousings are the principal members of the body structure.

In the body of the Brill trolley bus streamline design is followed, placing emphasis upon attractive appearance in the interest of public appeal. Eight Brill exhaust ventilators, an adequately large ventilator under the metal sun visor over the windshield and two louvre type ventilators over the rear window supplement the raisable sash to the left of the operator. With the exception of windshield, adjoining wing sash, and that above the rear cross seat which are stationary, the windows are fitted with double sash, framed in tubular brass, the lower portion of which can be raised. The individual upper sash are stationary.

Inside the trolley bus, eleven Brill No. 306 semi-bucket type cove-back transverse seats with deep spring leather upholstered cushions, are provided together with longitudinal seats over wheelhousings and full width rear cross seat which also has semi-bucket cover type backs. For the operator, a Brill De Luxe 1001 seat, leather-upholstered, is adjustable both longitudinally and vertically to obtain maximum comfort for the operator. The Haskelite ceiling and inside finish, including side lining of plywood, are painted in harmony with the seat upholstery. Double coil cross-seat type electric heaters and cab heater located near the operator are also provided.

Double stream two-part folding doors for passenger entrance and exit at forward right-hand body corner are pneumatically controlled by the operator. Single stream double-folding exit doors on the right at rear are controlled by step treadle.

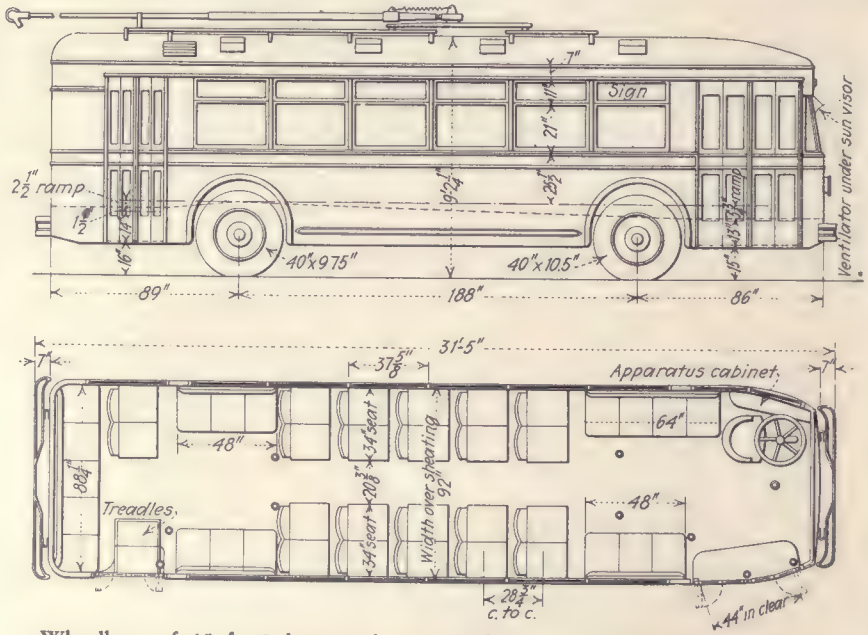
The rear axle of the Brill trolley bus is the standard Timken-Detroit dual worm Type No. 6536-W arranged for two motor drive, and the front axle is the Timken-Detroit one-piece forged axle No. 1669-W. Consequently the yellow pine floor, level at front platform, has a ramp back to wheelhousing from which point there is a 2-in. ramp downward to the rear.

A wheelbase of 15 ft. 8 in. is arranged to permit an overhang at rear of 7 ft. 5 in. and 7 ft. 2 in. at front. With the mounting of practically all equipment toward the rear and the long overhang at this point a load distribution of 40 per cent at front and 60 per cent at rear is obtained. The tire equipment consists of 40x9.75 dual tires at rear, and 40x10.5 single at front recommended by tire manufacturers for this type and weight of vehicle.

In the last eight trolley buses furnished to Chicago, the electrical equipment was furnished by the Westinghouse Electric & Manufacturing Company. Motors are two 50-hp., 600-volt Westinghouse 1426-CT-6 type. Control is the single-end automotive accelerating type, foot-pedal operation, with remote type control. The contactor box, reverser and other such equipment are housed in a noise-insulated compartment under the rear transverse seat. Access to this compartment is from the outside through an especially designed hinged door.

Completely equipped ready for operation the latest type Brill 40-passenger trolley bus furnished Chicago weighed 17,640 lb. and were equipped as follows:

Air brakes	Westinghouse DH-10
Axles	Timken-Detroit
Brakes	Timken four-wheel drum type
Bumpers	A. C. Co., spring steel
Buzzers	Consolidated Car Heating Co.
Car trimmings	Statuary bronze
Conduits and junction boxes	Flexible
Control	Westinghouse Type VA, single-end.
Registers	International R-10
Sash fixtures	Adams & Westlake, brass sash
Seats	Brill No. 306 semi-bucket type
Seating material	Leather
Springs	Detroit Steel Products Co.
Step treads	Kass safety
Tail lights	American Car Co.
Trolley retrievers	Ohio Brass Company
Destination signs	Hunter illuminated
Door operating mechanism	National Pneumatic Company
Hand brakes	Propeller shaft type
Heaters	Consolidated Car Heating Company
Headlights	Ohio Brass Company
Headlining	¼-in. Haskelite
Motors	Two Westinghouse Type 1426-CT-6
Paint	Duco
Trolley base	Ohio Brass Company
Ventilators	Railway Utility Company
Wheels	Budd ventilated type
Speedometer	Stewart-Warner
Steering gear	Ross
Horn	Pneuphonic
Thermostat	Consolidated Car Heating Company



Wheelbase of 15 ft. 8 in. permits an overhang at rear of 7 ft. 5 in. and 7 ft. 2 in. at front

Extensive Car Replacements Needed

Recovery of the car building industry from the doldrums which have enveloped it for the past five years is inevitable, according to George Frey, vice-president of the J. G. Brill Company. Mr. Frey is not prepared to say when the recovery will begin, but he believes that the rail ways cannot delay making replacements much longer.

According to an interview with him in the *Philadelphia Record* he said that approximately 50 per cent of the street cars now in operation in the United States are hopelessly antiquated and many of them were built to conform to the needs and transportation theories of 25 years ago.

"Replacement of this out-of-date equipment," said Mr. Frey, "is imperative for railroads and street railway companies in order for them to compete with motor coaches and the private automobile. But they are deferring the placing of orders under a program of economy forced upon them by unfavorable circumstances. They cannot wait much longer." He listed high taxation, paving charges and politics among the circumstances holding back developments, all of which discourage financing projects.

Up to five years ago the 30-acre Brill plant in Philadelphia, according to Mr. Frey, produced an average of 3,000 cars a year and operated under the slogan of a car an hour. Since 1925, however, the output has dropped to an average of only 500 cars annually. The present industrial depression, he added, had little effect on street car building and had resulted in scarcely any curtailment on the Brill plant personnel.

Mr. Frey believes that the electric trolley car operating on tracks is in no danger of becoming extinct despite the challenge of motor coaches, trolley buses and other forms of transportation. But the trolley of tomorrow will scarcely be recognized as a descendant of the old type car, bare and comfortless, still in use in many cities.

Luxury will be the keynote of the trolley of the future as it even now is beginning to be. Luxurious fittings, deep cushioned leather seats, designed for comfort and elegance will be enjoyed by the man riding to work. There will be linoleum on the floor and decorative effects throughout. Observation platforms have been planned on interurban lines. The death knell of the "Toonerville trolley" transportation has been definitely sounded.

Final Lot of Steel Motor Cars Delivered to L.I.R.R.

Thirteen new steel motor cars, the last of the final installment of 85, have been delivered to and placed in service by the Long Island Railroad. This increase in passenger equipment has been obtained at an approximate cost of $3,000,000. It has also been necessary to appropriate a further sum of approximately $1,500,000 for the erection of nine substations and the extension of transmission lines, in order to take care of the power requirements of this additional rolling stock.

The new equipment includes roller bearing trucks, automatic door and train control, improved interior lighting arrangement, automatic ventilators, higher powered headlights and windshield wipers on motorman's cab window. The Long Island Railroad now has a total of 1,438 passenger cars, all of steel construction.



New one-man car recently placed in service by the York Railways

York Railways Accept Delivery of Three New Cars

York Railways, York, Pa., has recently placed in service three one-man, city type cars delivered by the J. G. Brill Company. The cars have a seating capacity of 50 passengers and are equipped with folding doors at the ends. Detailed specifications are as follows:

Name of railway	York Railways, York, Pa.
Number of units	3
Type of unit	One-man, motor, passenger, city, double end, double truck
Number of seats	50
Builder of car body	J. G. Brill Co., Philadelphia, Pa.
Date of order	5/27/30
Date of delivery	10/27/30
Weights: Car body	17,350 lb.
Trucks	13,550 lb.
Equipment	2,700 lb.
Total	33,600 lb.
Bolster centers	19 ft. 10 in.
Length over-all	43 ft. 3 in.
Length over body posts	29 ft. 10 in.
Truck wheelbase	4 ft. 10 in.
Width over-all	8 ft. 5½ in.
Height, rail to trolley base	10 ft. 5⅞ in.
Body	All steel
Roof	Arch
Doors	End
Air brakes	General Electric straight
Armature bearings	Plain
Axles	ASTM—A-20-27 annealed
Car signal system	Faraday
Compressors	General Electric Co. CP-27-B
Conduit	Flexible
Control	Type K
Couplers	Portable bar
Curtain fixtures	XL-80
Curtain material	Pantasote No. 86, Green "K" Morocco
Destination signs	Keystone
Door mechanism	National Pneumatic Co.
Doors	Folding
Energy saving device	Economy watt hour meter
Finish	Keeler & Long
Floor covering	Armstrong linoleum
Gears and pinions	Tool Steel Gear & Pinion Co.
Glass	Plate, upper doors D. A.; lower doors, clear wire
Hand brakes	Peacock staffless
Heaters	Consolidated
Headlights	Electric Service Supplies Co. FH-916
Headlining	Agasote
Interior trim	Bronze, statuary finish
Journal bearings	Plain
Journal boxes	Brill semi-steel
Lamp fixtures	Electric Service Supplies Co.
Motors	Four GE-264-F, inside hung
Painting scheme	Orange, cream and maroon
Registers	International R-12 and R-8
Roof material	¼" tongue-and-grooved, poplar
Safety car devices	LB-4 control
Sash fixtures	O. M. Edwards brass
Seats	Brill 201-E
Seat spacing	31 in.
Slack adjusters	Brill mechanical
Steps	Stationary
Step treads	Kass
Trolley retrievers	Earll standard
Trolley base	US-20
Trolley wheels	General Electric Co.
Trucks	Brill 84-E-1-X
Ventilators	Brill square type exhaust
Wheels	Davis cast steel, diameter 26 in.
Wheelguards	H-B



Interior seating arrangement for 50-passenger capacity

English Railway Places Large Order for Electrical Equipment

Orders amounting to nearly £500,000 have been placed by the Southern Railway of England with two British firms for the electrical equipment of trains to be operated on the extension of the electrified system to Reigate, Brighton and Worthing and also for such additional trains to be provided to meet increasing passenger traffic in the London suburban areas. The orders were placed with the Metropolitan-Vickers Electrical Company, and the British Thomson-Houston Company. Electrical equipment has been ordered for 23 six-car and three five-car motor units for the trains on the Brighton line; 40 four-car motor units for the trains on the semi-fast system to Reigate, Brighton and Worthing, and twelve three-car motor units and six two-car trailer units for the additional rolling stock on suburban service. The car bodies will be built in the work shops of the Southern Railway.

30,000,000 Tons of Scrap used by Steel and Iron Industry

According to the first survey ever made of the consumption of scrap iron and steel, nearly 30,000,000 gross tons were used in 1929 in the iron and steel industry, announces Benjamin Schwartz, director general of the Institute of Scrap Iron & Steel, Inc. Of this amount about 5/6 was converted into steel ingots; the iron industry used the rest. The survey reveals also that the trend of the steel industry is toward processes that require a large scrap tonnage, according to Mr. Schwartz. At the present time the average consumption of companies that do not employ the Bessemer process is 55 per cent scrap and 45 per cent pig iron.

Eccles & Davies Machinery Company, Inc., Los Angeles, Cal., have been appointed agents for the Hollup Corporation, Chicago, Ill., manufacturers of Hollup welders and Hollup welding rods for all purposes. Stocks will be moved from the East in carload lots to California for the purpose of giving patrons the benefit of lowest possible prices.

BUS DELIVERIES

British Columbia Electric Company, Vancouver, B. C., two White Model 613.

City of Detroit, Department of Street Railways, 50 A.C.F., all-steel 40-passenger gas-electric Metropolitan type.

Denver Tramway, Denver, Col., one Mack Model BC, 29-passenger city type.

Illinois Power & Light Corporation, Chicago, Ill., ten Mack Model BC, 29-passenger city type.

Louisiana Power & Light Company, Algiers, La., five White Model 165A.

West Penn Electric Company, Pittsburgh, Pa., one White Model 54.

KDKA Celebrates Tenth Anniversary

With a special anniversary program at a dinner of the Pittsburgh Chamber of Commerce attended by many radio notables and leaders of industry, the tenth anniversary of broadcasting by Westinghouse radio station KDKA, pioneer broadcasting station, was observed recently. The anniversary program was broadcast over both KDKA and its short wave station W8XK.

Since the election of Warren G. Harding as president of the United States was broadcast Tuesday night, Nov. 2, 1920, the pioneer station of the world has not missed a single day of broadcasting. Since that first prescheduled program proved so successful, the radio industry has set a new record for progress and development.

From the modest experimental stations 2WE and 2WM, one of which



The site of the KDKA station at Saxonburg occupies 130 acres

was at the home of Dr. Frank Conrad, who broadcast entertainment programs each Saturday night, Westinghouse has kept pace with the remarkable progress of radio broadcasting by the construction of the new 400,000-watt transmitter at Saxonburg. This giant station required the solution of many engineering problems before it was ready to broadcast programs from the William Penn Hotel studios of KDKA, 30 miles away.

Electric Railway Material Prices—December 1, 1930

Metals—New York

Copper, electrolytic, delivered, cents per lb.	11.00
Lead, cents per lb.	5.10
Nickel, ingot, cents per lb.	35.00
Zinc, cents per lb.	4.11
Tin, Straits, cents per lb.	26.14
Aluminum, 98 to 99 per cent, cents per lb.	22.90
Babbitt metal, warehouse, cents per lb.:	
Commercial grade	35.00
General service	30.00

Bituminous Coal

Pittsburgh mine run, net ton	$1.40
Central, Ill., screenings	0.70
Kansas screenings, Kansas City	1.50
Big Seam, Ala., mine run	1.50
Smokeless mine run, Chicago	2.05

Track Materials—Pittsburgh

Standard steel rails, gross ton	$43.00
Track spikes, $\frac{5}{16}$-in. and larger, per 100 lb.	2.80
Tie plates, cents per 100 lb.	2.075
Angle bars, cents per 100 lb.	2.75
Track bolts, per 100 lb.	3.90
Ties, white oak, Chicago, 6 in. x 8 in. x 8 ft.	1.35

Hardware—Pittsburgh

Wire nails, per keg	$1.95
Sheet iron (24 gage), cents per lb.	2.35
Sheet iron, galvanized (24 gage), cents per lb.	2.95
Auto body sheets (20 gage), cents per lb.	3.40

Waste—New York

Waste, wool, cents per lb.	12.00 to 15.00
Waste, cotton (100 lb. bale), cents per lb.:	
White	9.00 to 13.00
Colored	5.00 to 7.00

Paint Materials—New York

Linseed oil (5 bbl. lots), cents per lb.	10.00
White lead in oil (100 lb. keg), cents per lb.	13.75
Turpentine (bbl. lots), per gal.	0.48
Putty, 100 lb. tins, cents per lb.	5.50

Wire—New York

Bare copper wire, cents per lb.	13.25
Rubber-covered wire, No. 14, per 1,000 ft.	5.65
Weatherproof wire base, cents per lb.	14.6

Paving Materials

Paving stone, granite, 5 in., f.o.b.:	
New York—Grade 1, per thousand	$150.00
Wood block paving 3$\frac{1}{2}$, 16 lb. treatment, N. Y., per sq.yd., f.o.b.	2.50
Paving brick 3$\frac{1}{2}$x8$\frac{1}{2}$x4, N. Y., per 1,000 in. carload lots, f.o.b.	50.00
Paving brick, 3x8$\frac{1}{2}$x4, N. Y., per 1,000 in. carload lots, f.o.b.	45.00
Crushed stone, $\frac{3}{4}$-in., carload lots, N. Y., per cu.yd., delivered	3.40
Cement, Chicago, in carload lots, without bags, f.o.b.	1.95
Gravel, $\frac{3}{4}$-in., cu.yd., delivered New York	3.40
Sand, cu.yd., delivered New York	2.15
Asphalt (Texas), in package, N. Y., per ton	22.50

Scrap Metal—New York

Heavy copper, cents per lb.	8.50
Light copper, cents per lb.	7.75
Heavy yellow brass, cents per lb.	5.25
Zinc, old scrap, cents per lb.	2.00
Lead, heavy, cents per lb.	4.25
Mixed babbit, cents per lb.	4.50
Battery lead plates, cents per lb.	2.13

Old Material—Chicago

Steel car axles, net ton	$13.25
Cast iron car wheels, gross ton	12.00
Steel car wheels, gross ton	13.75
Leaf springs, cut apart, gross ton	13.75
Angle bars, gross ton	12.25
Brake shoes, net ton	7.50
Rails (short), gross ton	12.75
Rails (relaying), gross ton (65 lb. and heavier)	28.50
Machine shop turnings, gross ton	5.00

TRADE NOTES

J. H. Williams & Company, manufacturers of drop forgings and drop-forged tools, have just closed contracts for an addition to their plant at Buffalo, N. Y. The extension will provide an increase of approximately 30,000 sq.ft. in floor space, to be used for additional heat-treating facilities and for finishing, assembling and storage of stock products.

Maj. Walter C. Sanders, U. S. Army Reserve Corps, was ordered to active duty in Washington, D. C., from Nov. 9 to Nov. 22, where he was assigned to the office of the Assistant Secretary of War to study War Department transportation problems. Major Sanders is general manager of the railway division of the Timken Roller Bearing Company.

Southern Tractor Supply Company, 406 Geer Building, Durham, N. C., has been appointed exclusive representative for the sale of Amsco tractor links and sprockets in the District of Columbia, North Carolina, South Carolina, Eastern Tennessee, Virginia and West Virginia.

Okonite Company announces the appointment of J. E. Harrall as sales representative to the light and power industry in the district which centers around Philadelphia. Mr. Harrall was formerly district sales manager of Safety Cable Company, division of General Cable Corporation with headquarters in Philadelphia. W. R. Van Steenburgh has been appointed manager of the light and power department of the New York office territory. Mr. Van Steenburgh will direct sales and engineering activities in New York, New Jersey, Pennsylvania, Delaware, Maryland, West Virginia and the District of Columbia.

Westinghouse Completes New Subway Order

Final shipment has just been made by the Westinghouse Electric & Manufacturing Company on the largest contract for subway control ever awarded. This order included 300 sets of controls for the Eighth Avenue subway in New York. Shipment was made to the Board of Transportation of New York City. Electrical equipment for the contract also includes 610 motors of 190 hp. each. The last of these power units will have been shipped by Westinghouse by the end of the year.

Old Generator Finds a Haven in the Franklin Institute

After many years of satisfactory and continuous service in various locations of the Philadelphia Rapid Transit Company, an electric generator has come to the end of the trail in the Museum of Electricity of the Franklin Institute, Philadelphia. The machine was sought by the Ford Museum in Dearborn, but there was a natural wish to keep the generator in Philadelphia. The machine was manufactured by the General Electric Company, and shipped to the World's Fair in Chicago in 1893, where it was acquired by the P.R.T. The generator was first used as a light generator in the Sutherland Avenue Power Station, the first electric railway generating station in Philadelphia.



Emergency Brakes that Brake—every time!

Peacock Staffless Brakes are dependable . . . when the emergency occurs they are there with lots of power . . . fast on the take up . . . and they never clog with chain *no matter how much slack there may be in the rigging.*

Sturdy, rugged brakes. Light in weight. Compact, take up little platform space. And braking force is 3000 pounds. When you buy specify Peacock Staffless Brakes.

NATIONAL
BRAKE CO., INC.
Buffalo, N. Y.

Canadian Representative
Lyman Tube & Supply Co., Ltd.,
Montreal, Can.

The Ellcon Company—General Sales Representatives, 50 Church St., New York



PEACOCK STAFFLESS BRAKES

OPERATION OF K RIMS IS SIMPLICITY ITSELF!



Pry No. 1—at the joint



Pry No. 2—at the side. Rim is ready for tire

To save time and cost use K Rims *as standard fleet equipment*

Fastest rim to operate. Two pries with a bar prepare K Rims for mounting tires. When tire is mounted, rim parts are firmly locked together and will not separate — always safe on road. Open valve-stem slot for further ease in handling. K Rims are interchangeable when used for singles or duals. Construction strong and light and permits maximum ventilation for heated brake drums. They guard against premature tire failure; economical always. Standard rims for money-making trucks and buses everywhere. Specify for your fleet now.

THE MAN WHO CHANGES THE TIRES LIKES K RIMS

GOODYEAR

K RIM EQUIPMENT FOR TRUCKS AND BUSES

All vehicles of Columbia Gorge Motor Coach System, Portland, Oregon, are equipped with Goodyear Bus Balloon Tires



"Traction so good, chains were rarely used"

—and it was mountain driving in winter!

"Portland—Boise—Bend—Pendleton—Yakima—Spokane—Lewiston—Salt Lake—Chicago"—these are the names on the side of this coach, and if you spot those cities on the map, you will find real mountain driving between them.

"Since this company's equipment has all been changed over to balloon tires," says a letter from Columbia Gorge Motor Coach System, "it has been noted that the mileage per tire has increased greatly with practically no delay of schedules on account of tire trouble... also, as we have gone through the worst of the winter months, we can say that these tires have very good traction on wet and slippery pavements, considering the fact that chains have only been used on our buses when road conditions were unusually bad and for only a very short time."

The tires, of course, are Goodyear Bus Balloons—the traction being provided by the famous Goodyear All-Weather Tread.

GOODYEAR

The Greatest Name in Rubber

ON YOUR NEW COACHES SPECIFY GOODYEARS



Group observing operation of electrically operated model of "Mortar-Flow" Pulsator.

Make Your Own Demonstration Of The "Mortar-Flow"* Principle On Your Own Desk!

SEVERAL operating, quarter size models of the "Mortar-Flow" Pulsator (Derail Type) are now available for a demonstration which you can make yourself in your own office to a group of your track men. On request the model, with complete instructions for its operation, will be expressed direct to your office.

Only by actually seeing the "mortar-flow" method (vibration during placement) in operation can you see the reason why it makes *all* the concrete in any type of construction effective; how, by causing the concrete to flow and bond with the steel, it fills all voids and seals the track structure against surface water—see how the labor of spreading and leveling is reduced; how hand tamping is eliminated and why a denser, more waterproof concrete is produced because excess water is brought to the top of the slab.

See why maximum results with the "mortar-flow" method (vibration during placement) are obtained with Steel Twin Ties.

You've heard about it; how widely it is approved by users—now see it operating on your own desk. There is no obligation of any kind except to return the model when you have finished with it, express collect.

IN using the "Mortar-Flow" Principle, for vibration of any type of track structure during placement of concrete to cause it to settle, flow, fill voids and bond with the structure, you are protected by U. S. Patent Nos. 1,745,744 and 1,770,154.

*The "Mortar-Flow" Principle is the vibration of the structure during concreting.

THE INTERNATIONAL STEEL TIE CO., Cleveland, Ohio



A Comfortable, Sanitary and Modern Seat!

HERE is a seat which maintenance engineers will appreciate. Its close-woven cane webbing back and cushion are easy to keep clean. The genuine leather facing on the cushion reinforces the seat at the greatest point of wear. In addition, the individual backs and deep, spring cushions are shaped to allow proper posture and leg freedom. Mechanism rails are set in and the frame of the chair is made of selected Northern hard-grained ash, further strengthened by malleable iron braces. Write to the nearest Heywood-Wakefield sales office for complete details of the 327-M Special and other popular bus and electric railway seats in our line.



If you have not received a copy of our new Bus Seat Catalogue, write for it.

HEYWOOD - WAKEFIELD COMPANY

BOSTON, MASSACHUSETTS

516 West 34th St., New York City
J. R. Hayward, Liberty Trust Bldg., Roanoke, Va.
H. G. Cook, Hobart Bldg., San Francisco, Calif.
439 Railway Exchange Bldg., Chicago, Ill.
A. W. Arlin, Delta Bldg., Los Angeles, Calif.
The G. F. Cotter Supply Co., Houston, Texas
The Railway and Power Engineering Corporation
133 Eastern Ave., Toronto; Montreal; Winnipeg, Canada

Now Berkeley Chooses Fluted Steel POLES



Berkeley, California, is noted for its beautiful thoroughfares

REPLACING other poles and individual lighting standards, Union Metal Heavy Duty Poles have transformed the appearance of San Pablo Avenue in Berkeley, California.

These 32-foot poles perform their numerous duties safely and with a minimum of attention. Slender, straight and uniform, they represent the ideal method of carrying electrical services through city streets.

In Berkeley the Union Metal Poles are equipped with twin street lighting units, cross arms, trolley span-wire supports and concealed cable-risers. In numerous other cities they are also used for a multitude of duties — often at a great saving in cost and always to the betterment of street appearance.

If you are not familiar with this advanced type of pole write for complete information.

THE UNION METAL MANUFACTURING COMPANY
GENERAL OFFICES AND FACTORY ◆ CANTON, OHIO
SALES OFFICES: New York, Chicago, Cleveland, Boston, Los Angeles, San Francisco, Seattle, Dallas, Atlanta

DISTRIBUTORS
General Electric Merchandise Distributors Graybar Electric Company, Inc.
Offices in all principal cities

Distributed by Graybar

UNION METAL DISTRIBUTION POLES



Changing the complexion of a white elephant in Olean, N. Y.

The economical conditions affecting many of the hundreds of small inter-urban properties in America are, in many respects, identical.

Transportation men, individually and collectively, have studied and analyzed this problem repeatedly, yet it still remains one of the most discussed problems of transportation.

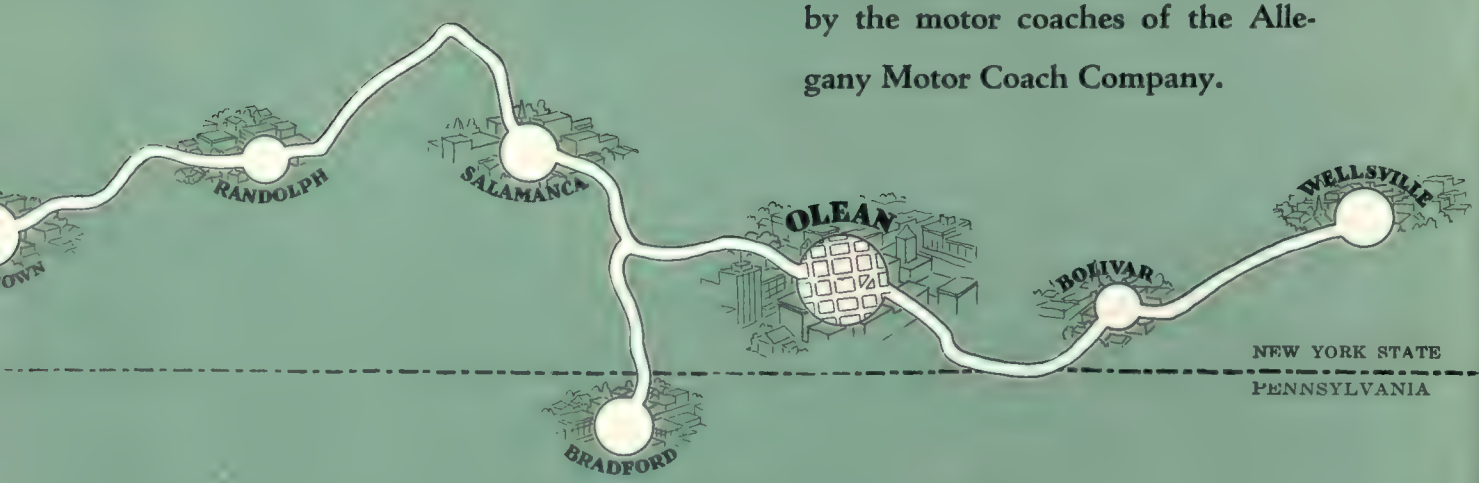
Here is another splendid example of how a small city and inter-urban operation, that had become hopelessly involved financially, went all bus — *with gratifying results.*

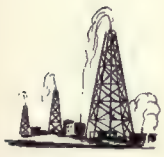
It can be done with

Yellow Coaches



Much the same territory previously served by the abandoned urban and interurban rail lines is now served by the motor coaches of the Allegany Motor Coach Company.





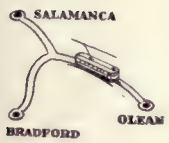
The oil boom in the Pennsylvania fields made Olean a prosperous community.

50 years ago, oil was discovered near Olean, N. Y. and the population of that busy little community had suddenly doubled — trebled. It had become a city of 10,000 people. So, its progressive citizens organized and financed a needed street railway — 1.1 miles of single track running from the railway station to the center of town! Three horse cars operating on 3 foot 6 inch track of 25 pound rail. The schedule was every 30 minutes and it took 20 minutes to cover the route.



It took twenty minutes to cover one mile of route.

37 years ago, they were talking modernization in Olean. The transportation system had prospered. During the previous year 140,774 passengers had been carried at a 5 cent rate of fare, track mileage had been increased to 2.5 and a fourth car had been added at a cost of $314. John Forbes, President and General Manager, was receiving a salary of $1,020 a year. Drivers were paid $1.33 for a nine-hour day. Times had been good. The net annual earnings amounted to $2,661. It was an opportune time to modernize. The age of electricity had arrived. So, in 1893, electric cars were substituted for horse cars. Refinancing was easy.



Temporary conditions favored expansion and consolidation.

27 years ago they were talking consolidation in Olean. Bradford, a neighboring city just over the Pennsylvania line, also had a railway company. Interurban service between the two prosperous cities had been established as a joint operation. Then everything was consolidated. In 1906 the new company was operating 59.9 miles of single track and 27 cars, but the investment now amounted to $2,061,000. Net profits amounted to $51,000 — a 2½ per cent return.

Further expansion followed. Just 20 years ago the company had cumulated investments of $5,000,000, half of it a bonded indebtedness. Income, however, had grown to $377,802, net to $193,360 — still a 2½ per cent return.



The peak of passenger revenue was reached when the automobile arrived.

But the peak of passenger revenue and income had been reached. Automobile competition had arrived. The oil boom in Pennsylvania was over. Transportation revenues began dropping steadily year after year and despite fare increases the net finally dipped far under the amount needed to pay interest on the bonded debt, to say nothing of paying a return on the stock issued.

It can be done - with

Yellow

Coaches



Disgruntled stockholders became bitter in their denunciations.



The coach operation replaced the 90 mile interurban with its $5,000,000 capitalization.



The new transportation system is making a good return on its investment.



Every month in 1930 but one has been ahead of 1929 in revenue.

Service became a travesty. Slow and infrequent schedules, breakdowns and accidents became the order of the day. Wages finally represented 53 per cent of all expenses, costs per car mile amounted to 48 cents. Disgruntled stockholders became bitter in their denunciations.

Three years ago, the court ordered the property abandoned.

A more far-sighted management might have met this problem more successfully. Bond holders and stock holders might have suffered less if everyone concerned had faced the situation squarely and planned for a sound capital reorganization and revamping of the property —

For here is what actually happened.
An outsider stepped in where local talent feared to tread. Local investors and local management had fought shy of re-organization along any lines. Local transportation was in bad repute. Local capital was uninterested and afraid.

But an experienced outsider, who knew what could be accomplished with a well managed bus operation, reviewed the situation and with his own limited capital, but ample vision, started—The Allegany Motor Coach Company. And the result —

In 1928 — serving the same territory — 560,000 passengers were carried at a net earning of $11,703, or about 7.5 per cent on investment. This with only 10 coaches.

In 1929 — 600,000 passengers were carried earning $125,296 gross and a net of $12,892, or 8.2 per cent return. With the purchase of additional Yellow Coach equipment, plus operation and careful supervision, operating costs dropped from 24.2 cents per mile to 20 cents per mile.

Every month in 1930 but one has been ahead of 1929 in revenues.

Now 20 employees give adequate service to the community as against 225 at the peak of traction service. There are fewer miles operated and the service may be less frequent, but it is entirely adequate and satisfactory to the public. What is most important, the transportation service is again on a sound and profitable basis.

Faith in motor coach transportation and in Yellow Coach equipment enabled The Allegany Motor Coach Company to carry on from where the trolley had left off and converted a white elephant into a profitable business.

It can be done—with

Yellow Coaches

GENERAL MOTORS TRUCK CO. - - PONTIAC, MICH.
Subsidiary of Yellow Truck & Coach Mfg. Co.



There is no insurance for prosperity like a sustained effort which is not diminished in face of discouraging outlooks, nor over-stimulated by too much optimism.

For many decades, Collier Service Car Cards have kept steadily at it, urging riders to buy. Rain or shine they have been promoting business and so helping to maintain traffic. Better still, they have been a source of income on which the Electric Railway Operating Companies have been able to rely, regardless of the condition of business generally.

CAR CARD ADVERTISING ALMOST EVERYWHERE

BARRON G. COLLIER

INCORPORATED
220 W. 42nd ST., N.Y.C



New Sales and Service Facilities for GREDAG
REG U. S. PAT OFF

• LUBRICANTS

ON November 1, 1930, the sales and service facilities for Gredag Lubricants, well known and long established products of the Acheson Graphite Corporation—a Unit of Union Carbide and Carbon Corporation—were greatly extended.

Gredag Lubricants are now being sold and distributed by the Carbon Sales Division of National Carbon Company, Inc.,—a technical organization which for many years has been in constant contact with industrial plants and distributors of industrial products.

The addition of Gredag Lubricants to the products of the Carbon Sales Division will bring into the lubrication field a force of competent sales engineers familiar with industrial problems. It will also add to the previous facilities five conveniently located Branch Sales Offices and Service Plants.

Please address your inquiries and orders for Gredag Lubricants to the nearest Branch Office of the Carbon Sales Division.

NATIONAL CARBON COMPANY, INC.

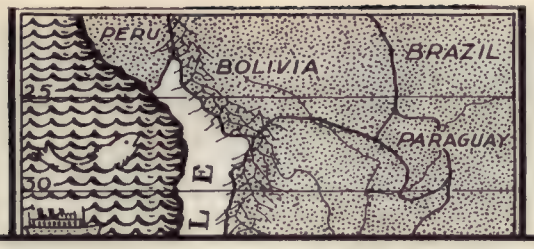
Carbon Sales Division

CLEVELAND, OHIO

Unit of Union Carbide and Carbon Corporation

Branch Offices and Factories

NEW YORK · PITTSBURGH · CHICAGO · BIRMINGHAM · SAN FRANCISCO



IN CHILE

Consolidated Equipment



Also Renders . . .
MODERN TRANSPORTATION SERVICE

Interior of Modern Surface Car

Built by

The Kuhlman Plant of the J. G. Brill Co.

Cars Purchased by

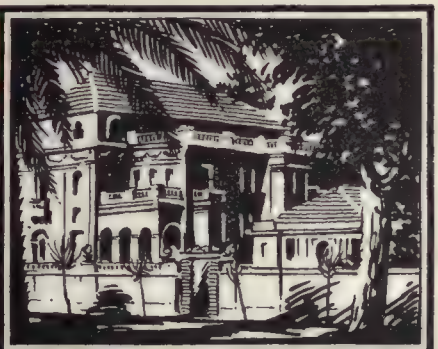
Cia. Chilena de Electricidad, Ltda.

for

Cia. de Traccion y Alumbrado de Santiago



Equipped with . . . .



The United States Embassy in Santiago

CONSOLIDATED

Pneumatic Door Operators

Electric Heaters

Buzzer System

CONSOLIDATED CAR-HEATING CO., INC.

NEW YORK ALBANY CHICAGO



GARY

WROUGHT STEEL WHEELS

The name ILLINOIS on wrought steel wheels assures the railroads safety, dependability and long life. These three factors all contribute to the success of the Gary Wrought Steel Wheel.

Our Wheel Engineers are at Your Service.



Illinois Steel Company
Subsidiary of United States Steel Corporation
General Offices
208 South La Salle Street, Chicago

Is this Coincidence?

All three winners in a national speed contest for rapid transit lines use car oils made by Standard Oil Company (Indiana)

We are not trying to convince you that Standard Oil Company (Indiana) car oils were the chief factors in winning this contest. But we do want to register strongly the fact that all three winners, noted for the high speed maintained on scheduled runs day after day, are constant users of Standard Oil Company (Indiana) car oils.

Only with correct lubrication could these rapid transit lines maintain continuous high speed service. It is not only the ability of Standard Oil Company (Indiana) car journal oils to lubricate effectively at all speeds but likewise the savings they make possible by reducing bearing troubles, power costs, waste and babbitt metal that make them popular with electric railway officials . . . and worthy of your consideration.

These journal oils are made of especially selected lubricating stocks and are refined for this one purpose. They do not glaze or harden on the waste. This reduces oiling periods, saving labor and waste costs. They have proven to be very successful in both high speed interurban and ordinary street car service.

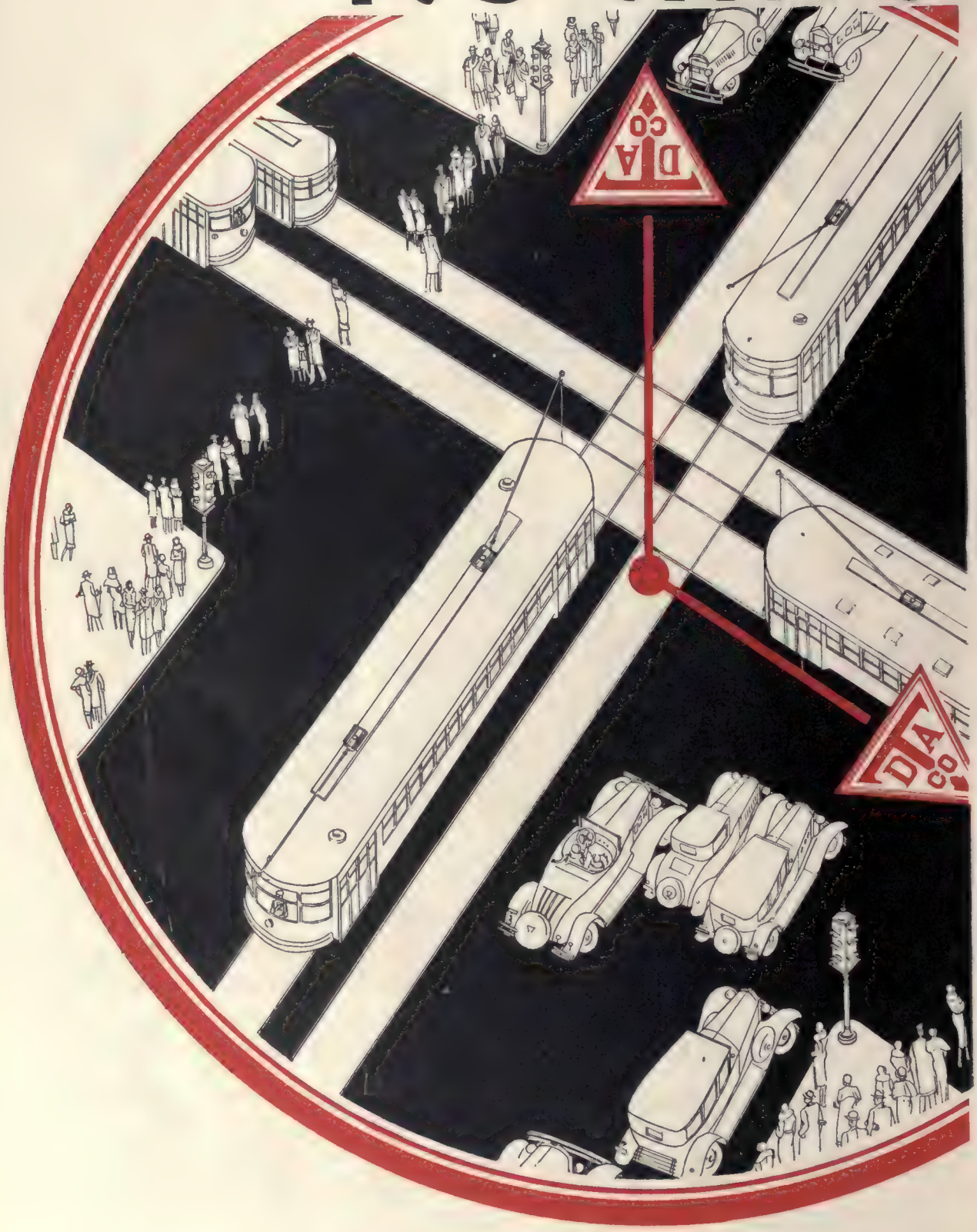
One of our men will be glad to discuss these oils with you . . . at your convenience.

STANDARD OIL COMPANY *(Indiana)*
General Offices: 910 S. Michigan Avenue, Chicago, Ill.

LUBRICANTS *for* ELECTRIC RAILWAYS

210

It's time



THE TIMKEN-DETROIT AXLE

to act



THERE seems to be a fundamental difference in the thinking habits which characterize the automotive and electric railway industries.

The automotive industry searches for new and better methods and equipment—one explanation for its astounding growth. It eagerly reaches out for improvements; tests them; adopts them.

The electric railway industry seems to pursue a more cautious policy. Certain men, to be sure, have shown a fine contempt for hampering tradition; but for the most part, new equipment continues to be "obsolete the day it is bought."

Timken has brought forward "something better"—the Timken Worm Drive Truck for electric railway cars.

It saves weight and power; lowers operating and maintenance costs, for track and equipment; eliminates most of the noise; and conserves man efficiency—the crews like Timken-equipped cars.

These cars appeal to car riders; once they ride in Timken worm-driven cars, their opinion of street car transportation takes a tremendous jump.

The electric railway industry needs constructive suggestions. We've made one. We've told the facts about it—been telling them for two years.

It's time for you to act.



TIMKEN
worm drive
TRUCKS
for electric railway cars

CO., DETROIT, MICHIGAN

KOOLMOTOR *perfect* winter

to Reading Transit Bus Company's large fleet . . . .



CITIES SERVICE OILS

ONCE - ALWAYS

COLD, bitter winter days cause no worry for the Reading Transit Bus Company — their buses are lubricated with KOOLMOTOR Motor Oil and KOOLMOTOR Transmission Oil— perfect cold weather lubricants. These companion products assure easy starting and easy shifting when engines are cold and — complete protection to friction surfaces and gears on the long, hard pulls that follow.

It is a tribute to the high and uniform quality of KOOLMOTOR products that they were chosen by the largest bus operator in Reading, Pa. The Reading Transit Bus Company's fleet of 18 buses travels approximately 1,000,000 miles a year, carrying about 1,500,000 passengers.

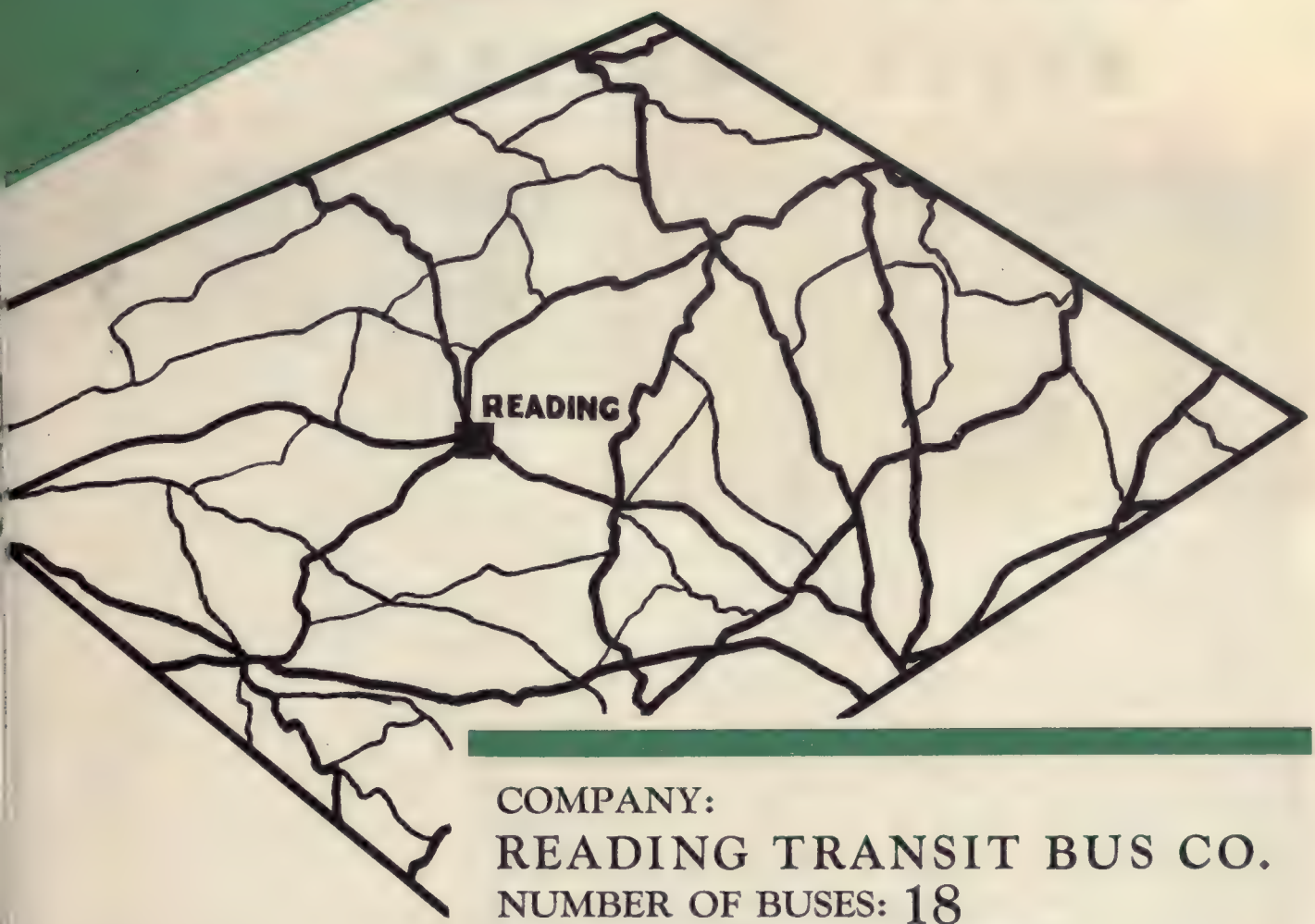
It will pay you to have a Cities Service engineer call, study your lubrication problem, and suggest ways and means of lowering your operating costs.

CITIES SERVICE COMPANY

60 WALL STREET, NEW YORK

KOOLMOTOR PRODUCTS

OILS give protection



COMPANY:

READING TRANSIT BUS CO.

NUMBER OF BUSES: 18

BUS MILES: 75,000 Per Month

PASSENGERS CARRIED: 125,000 Per Month

CITIES SERVICE PRODUCTS USED:

- KOOLMOTOR MOTOR OIL
- KOOLMOTOR TRANSMISSION OIL

A new low mark in wheel costs with

DAVIS "One-Wear" STEEL WHEELS



The high maintenance costs of removing, re-turning, and replacing car wheels can be permanently and materially reduced to a minor item in car operation.

Davis «One-Wear» Steel Wheels will do it.

The reason is in their manufacture and the alloy steel used.

They are produced by triple-heat treatment, part of a carefully developed manufacturing process.

The results are great wear resistance, strength, and lightness, and

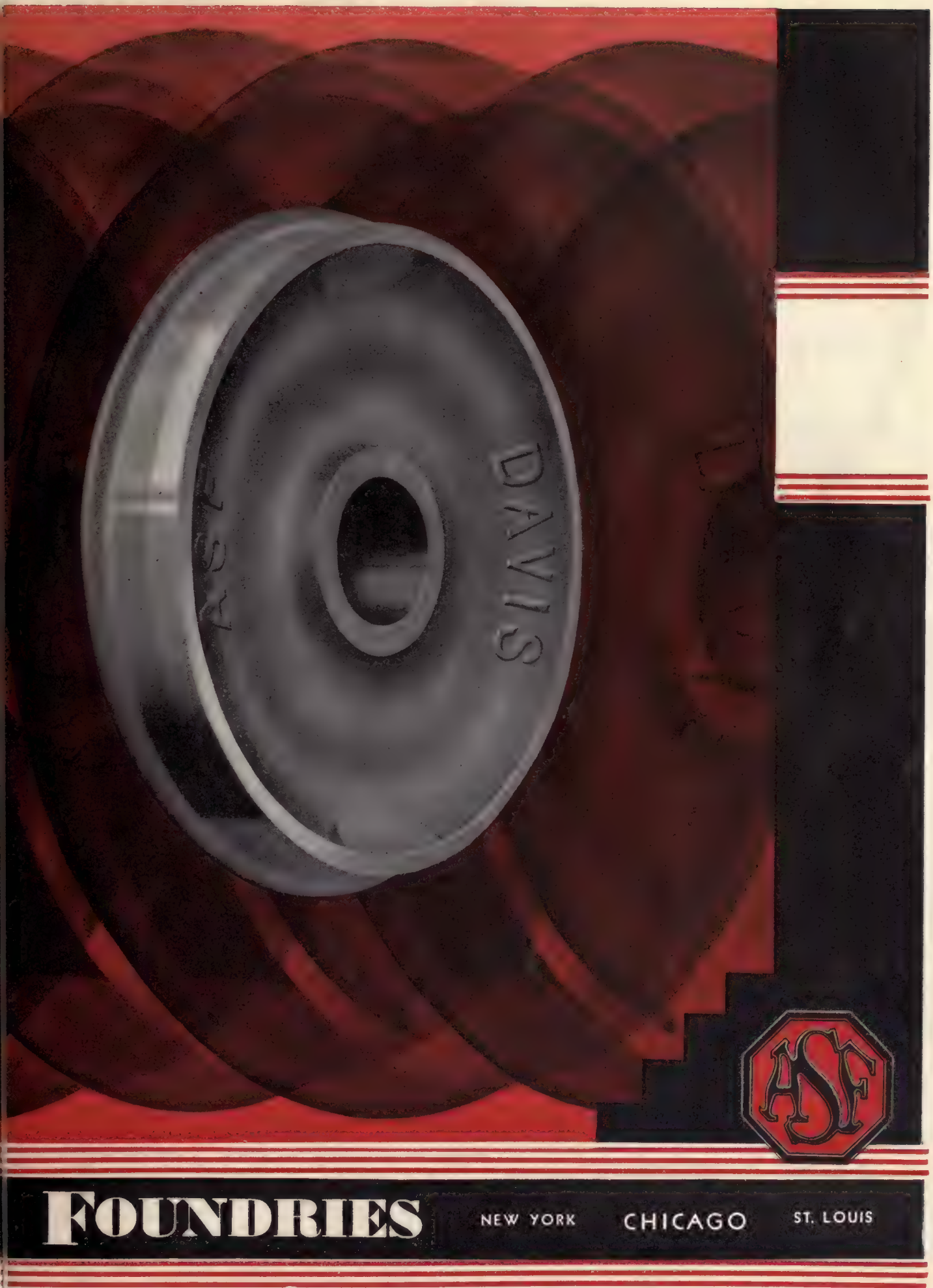
reduced operating costs per wheel mile, and

cars in service, earning revenue, not in the shop with flats and shellouts.

It is the answer to your car wheel upkeep problem.

We suggest you investigate as a matter of economy.

AMERICAN STEEL


DAVIS
ASF
FOUNDRIES
NEW YORK
CHICAGO
ST. LOUIS

Prompt Delivery *assured*



from these stocks of electrical insulation

Super-Micanite and Micanite for commutators, slots, rheostats and similar insulating needs! Empire Varnished Insulating Materials for motors, coils, cable joints, etc.! They are carried in stock in the cities starred on the above map.

Our representatives in these cities are at your service to help assure the prompt delivery for which the Mica Insulator Company is noted. Their knowledge of the characteristics and successful application of these insulations is yours to use at any time.

MICA INSULATOR COMPANY

New York: 200 Varick St. Chicago: 542 So. Dearborn St.

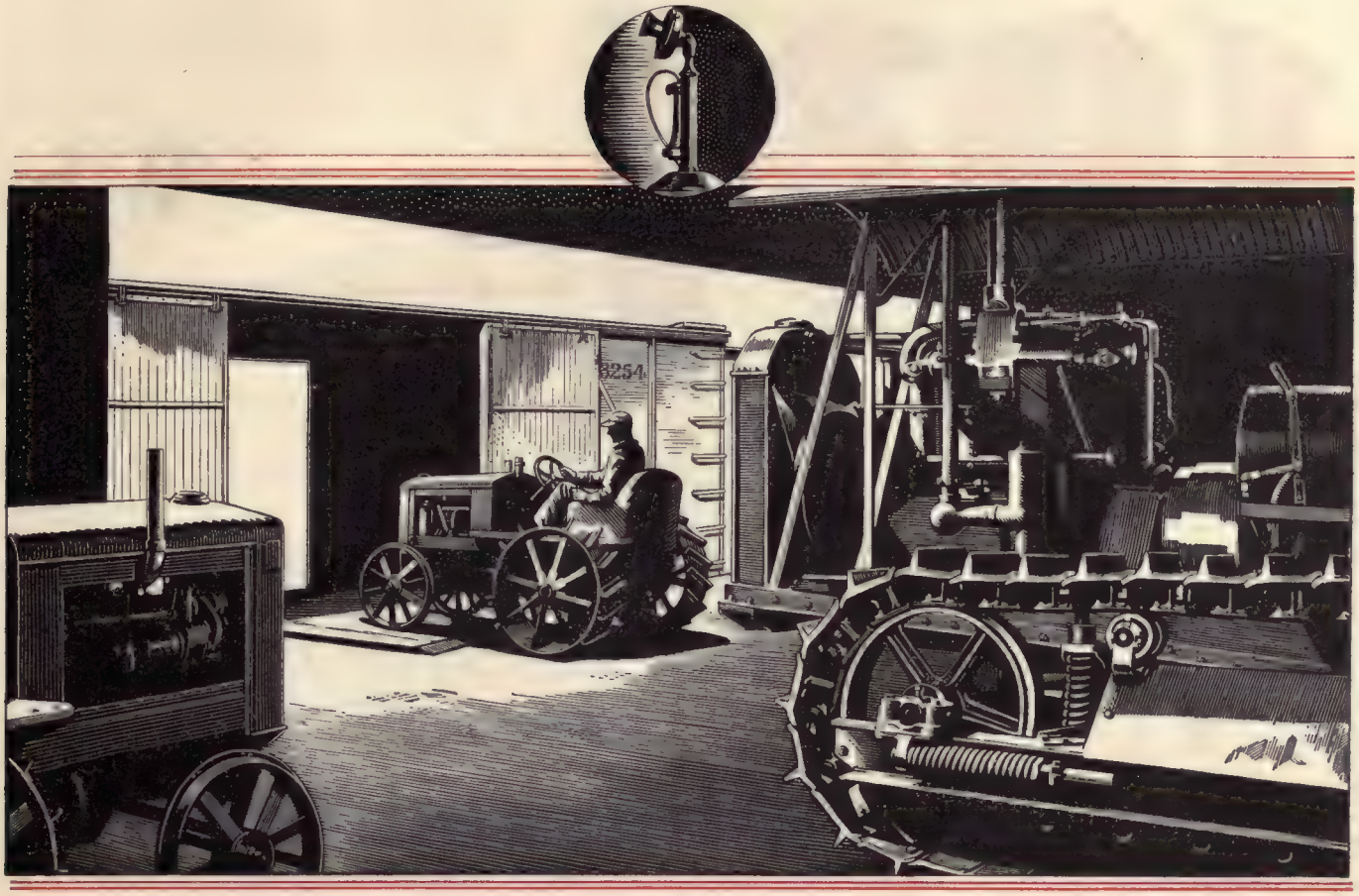
Cleveland Pittsburgh Cincinnati Birmingham Seattle San Francisco
Los Angeles Toronto Montreal *Works:* Schenectady, N. Y. London, Eng.

PERFECT MICANITE INSULATOR
REG. U.S. PAT. OFF.

Electrical INSULATION

PERFECT EMPIRE INSULATOR
REG. U.S. PAT. OFF

MICA INSULATION OILED CLOTH INSULATION



Business was Quiet...but the Telephone brought $22,200 in New Orders

A TRACTOR company's sales had fallen off to a marked degree. A telephone sales program to distant customers was decided upon. One result was $18,400 worth of business. Another, a $3800 order after the purchaser had refused a personal interview.

An Eastern lumber company regularly "visits" lumber yards in five states by telephone. In one month 550 carloads of lumber totaling nearly $500,000 were sold by this modern method. Toll bills averaged less than one-half of one per cent.

Business firms, large and small, are using out-of-town telephone service more than ever to increase sales . . . reduce distribution costs . . . meet competition. New markets are developed at little expense. Customers and prospects are economically contacted between salesmen's visits.

Develop your business by telephone. Best results are obtained by having a definite plan for executives and salesmen to follow. Your local Bell Telephone Business Office will gladly submit a plan to meet your needs.

Inter-city calls are cheap, definite, resultful. Typical station-to-station day rates: Pittsburgh to Indianapolis, $1.50. Boston to Atlanta, $3.50. New York to Baltimore, 90c. Philadelphia to Seattle, $8.50. Bell Telephone service is *Quick . . . Convenient . . . Universal.*

AMERICAN TELEPHONE & TELEGRAPH CO. BELL SYSTEM AND ASSOCIATED COMPANIES

1931— What

WHAT *has happened in the industry in 1930?*

DID WE *gain or lose—and how much?*

WHAT *are our prospects for 1931?*

THESE are the questions that community transportation men are asking themselves as this unusual year nears its close. The Annual Statistical and Progress Number will not only present complete, up-to-date statistics and forecasts regarding every important activity of the field, but it will also contain timely information about such pertinent topics as the trolley bus —rapid transit—trailers—bus operation and other subjects that are claiming the attention of transportation executives.

Look for the answers

will it mean to the ELECTRIC RAILWAYS?

NEVER was there a time when executives had greater need for FACTS than in this present period of abnormal business conditions. Figures, statistics, dependable data—this kind of information, interesting always, becomes vitally important at a time like this.

In its January issue, ELECTRIC RAILWAY JOURNAL will present the facts that transportation and manufacturing executives want and need in planning for 1931.

Figures and comparisons on costs and fares—expenditures and improvements—trackage—rolling stock and every other phase of general interest will be given, all brought up to date.

This year's record simply confirms past experience: in periods of dull business, the electric railway industry is among the least adversely affected. In the past half-century, the industry has weathered numerous "depressions" and gone forward again with but few scars. History promises to repeat at present. This year's revenues are off only slightly.

In addition to figures, statistics, trends and forecasts, the 1931 Statistical and Progress Number will contain a new and informative survey of Taxicab Operations by Electric Railways. This and other timely subjects will be discussed in interesting articles.

Here is a number you will want to study and keep close at hand throughout the year. If you want extra copies for others in your organization, order them early.

NNUAL
TATISTICAL
ND PROGRESS
UMBER

ADVERTISERS: Forms close December 22. This is a logical issue in which to use extra space and color.

— *in* ELECTRIC RAILWAY JOURNAL *for January*



Greetings

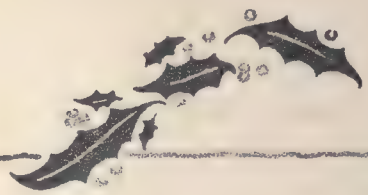
from

American Steel & Wire Company

Again the Yuletide, with its inspirations of good cheer is with us—the New Year approaches—and we sincerely extend to you our very best wishes for a very MERRY CHRISTMAS and a HAPPY, PROSPEROUS NINETEEN THIRTY-ONE



Rail Bonds



American Steel & Wire Company

SUBSIDIARY OF UNITED STATES STEEL CORPORATION

208 S. La Salle Street, Chicago — 30 Church Street, New York

Other Sales Offices: Atlanta, Baltimore, Birmingham, Boston, Buffalo, Cincinnati, Cleveland, Dallas, Denver, Detroit, Kansas City, Memphis, Milwaukee, Minneapolis-St. Paul, Oklahoma City, Philadelphia, Pittsburgh, Salt Lake City, St. Louis, Wilkes-Barre, Worcester

Pacific Coast Distributors: Columbia Steel Company, San Francisco, Los Angeles; Portland, Seattle, Honolulu

Export Distributors: United States Steel Products Co., 30 Church St., New York City

—and NOW!

the "6" series

of

FARGO
BUILT BY CHRYSLER MOTORS

MOTOR COACHES

supplementing the "8" series recently announced

by

FARGO MOTOR CORPORATION

DETROIT, MICHIGAN

A DIVISION OF CHRYSLER CORPORATION



In addition to the new and original "8" Series Coaches recently introduced, Fargo Motor Corporation also announces the new "6" Series. It comprises a Street Car with seats for 21 passengers and a Parlor Coach with seats for 16 passengers. » » Of conventional design and lower in price than the "8" Series Models, this supplementary line is the logical choice of



INTERIOR OF STREET CAR. *Ample aisle space, head-room and leg-room provided. Seats and seat backs of deep spring construction, upholstered in genuine leather. Non-rattling windows easily raised to provide 14" opening. Haskelite roof. Entrance door of two-leaf folding type—operated from driver's seat. Emergency door at rear. Three ventilators in roof. Six dome lights.*



REAR AXLE *of the full-floating, spiral bevel type with double roller wheel bearings and electric-furnace cast steel housing. Weight of coach and load is carried on housing—shafts are free to transmit power solely. Greater dependability is assured.*



FRONT VIEW. *Showing wide clear-vision windshield, large destination sign-box, rugged front bumper, large radiator and attractive appearance in every blended line and detail of design. Front end is a steel structure, amply reinforced, riveted, gussetted and welded to provide maximum strength.*

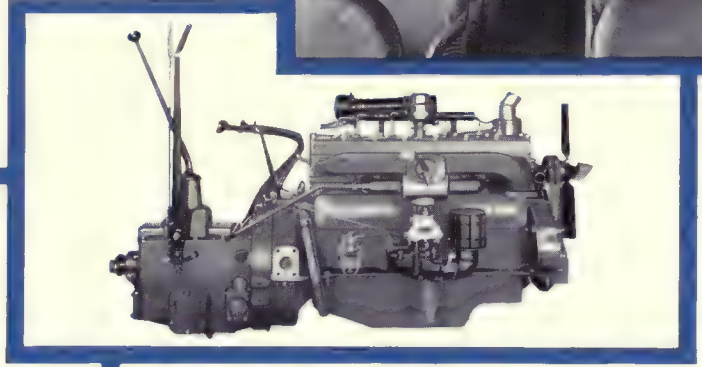


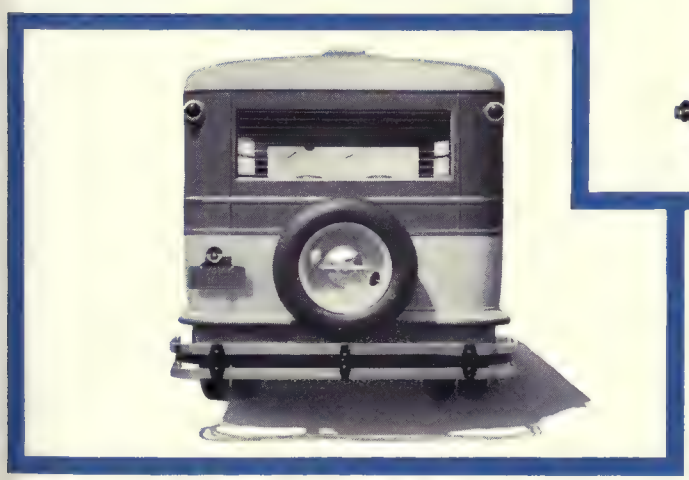
operators whose needs do not require the more advanced features and greater capacity provided in the "8" Series types. » » A few of the many features of these modern, practical "6" Series Coaches are illustrated and described below. Brief specifications will be found on the following page. For additional information write to Fargo Motor Corporation, Detroit, Mich.



INTERIOR OF PARLOR COACH. *Seats of the chair type, of steel tube framework, covered with wicker woven from fibre which will not crack, splinter or break. Detachable leather seat-back covers. Non-rattling windows that can be raised to provide 13" opening. Entrance door of one-piece type, operated from driver's seat. Emergency door at rear. Ten lights, designed in modernistic style and mounted along sides above windows.*

ENGINE *is 6-cylinder and develops 96 horsepower at 3000 R.P.M. The sturdy 4-speed transmission provides the needed flexibility for traffic or open road.*





REAR VIEW OF PARLOR COACH. *Note the sturdy bumper, and the guard rail that protects body at rear as well as on sides. Rear window is fitted with wire-reinforced glass. Chromium-plated baggage rack on roof with ladder at rear is provided if desired.*

CHASSIS SPECIFICATIONS

ENGINE: Type—L-Head; Number of Cylinders—6; Bore—3 5/8"; Stroke—5"; Piston Displacement—309.63 cu. in.; Maximum Brake H. P.—96 at 3000 R.P.M.; Torque—200 ft. lbs. at 1100 R.P.M.; Suspension—Four Point; Mounting—Front, Spring Type; Rear, Rigid.

CYLINDERS & CRANKCASE: Cast—Integral; Cylinders—En Bloc; Finish of Bore—Reamed and Honed; Cylinder Head—Detachable; Oil Passages—Drilled in Block.

PISTONS: Type—Ventilated Bridge, Split Skirt; Material—Aluminum Alloy; Special Steel Strut; Rings—4 Compression, 1 Oil.

CRANKSHAFT: Material—Drop Forged Special Steel; Weight—100 Pounds; Length—36 5/16"; Balanced—Statically and Dynamically; Number of Main Bearings—7; Total Length—11 3/4"; Total Bearing Area—96.90 sq. in.

FLY WHEEL: Balanced—Statically and Dynamically; Starting Gear—Steel ring shrunk on flywheel.

CAMSHAFT: Type—Cams and Gears Integral; Material—Drop Forged Alloy Steel; Number of Bearings—4.

VALVES: Type—Poppet; Location—Right Side of Cylinder Block; Material—Nickel Chromium Steel; Guides—Removable.

VALVE TAPPETS: Type—Mushroom; Material—Cold Drawn Carbon Steel; Head—Chilled Cast Iron Welded to Stem.

ENGINE LUBRICATION: Type—Forced Feed; Oil Pump—Gear Type; Drive—Camshaft; Pressure to Main, Connecting Rods and Camshaft Bearings and to Front End Drive; Positive Spray to Pistons, Cylinder Walls, Cams, Valve Stems and Tappets; Oil Pan—Electro Galvanized Pressed Steel; Capacity—8 Quarts; Crankcase Ventilator; Oil Filter.

CARBURETOR: Type—Air Valve Updraft; Oil Wetted Wire Mesh Air Cleaner.

FUEL PUMP: Type—Variable Stroke Diaphragm; Location—Right Rear of Crankcase; Drive—Rocker Arm off Camshaft; Filter and Sediment Trap.

ENGINE COOLING: Type—Centrifugal Pump; Thermostat; Radiator—Tubular; Shell, Chromium Plated; Fan—4 Blade; Drive—Extension of Water Pump Shaft; Heat Indicator—On Instrument Panel; Capacity of Entire System—5 3/4 Gallons.

BATTERY: Heavy Duty; Number of Cells—6; Number of Plates—13; Capacity—120 Ampere Hours.

DISTRIBUTOR: Heavy Duty Type; Location—Top of Cylinder Head; Drive—Vertical Shaft Gear Driven off Camshaft; Advance—Full Automatic.

GENERATOR: Location—Left Side of Engine at Front; Type—Shunt Field Voltage Regulator; Drive—2 Vee Belts Driven from Crankshaft; Mounting—Hinged for Adjustment of Driving Belts; Capacity—225 Watt; Voltage—12; Charging Rate—Hot, 12 Amps.—Cold, 16 Amps.

STARTER: Type—Positive Shift Two-Stage; Location—Left Side of Motor on Flywheel; Normal Speed of Turning Engine—100 R.P.M.

CLUTCH: Location—Unit with Power Plant; Type—Dry, Single Plate; Plate Diameter—13"; Release Mechanism—Graphite Composition; Pilot Bearing—Ball Bearing.

TRANSMISSION: Type—Selective Sliding Gear, Heavy Duty; Location—Unit with Power Plant; Number Speeds Forward—4; Number Speeds Reverse—1; Main Shaft—Ball Bearing; Countershaft—Roller Bearing; Main Shaft Pilot Bearing—Roller; Idler Shaft—Bronze Bushing (Run in Oil).

PROPELLER SHAFT: Type—Two Piece Tubular; Diameter—3"; Center Bearing—Self Aligning.

UNIVERSAL JOINTS: Type—Cross and Trunnion; Location—Transmission, Rear of Center Bearing and Rear Axle.

EMERGENCY BRAKE: Location—Rear of Center Bearing; Type—Ventilated Disc; Disc Diameter—14"; Total Braking Area—44.4 sq. in.

SERVICE BRAKES: Location—4 Wheels; Type—Hydraulic Internal Expanding; Control—Foot Pedals, Booster Actuated; Drum Diameter—Front, 16"—Rear, 16"; Lining—American Brakeblok; Width of Lining—Front, 2 1/2"—Rear, 3 1/2"; Braking Area—350.11 sq. in.; Drum Material—Cast Iron.

WHEELS: Type—Metal Disc, Dual Rear, 6 Mounting Studs; Rim Size—20x6 DT.

TIRES: Parlor Car—7.00/20 8-ply Dual; Street Car—7.50/20 8-ply Dual, Spacing 9".

FRONT AXLE: Type—Reverse Elliott I-Beam; Wheel Bearings—Double Tapered Roller.

REAR AXLE: Type—Full Floating; Housing—Banjo Type; Housing Material—Electric Furnace Steel Casting; Drive Gears—Spiral Bevel with Straddle Mounted Pinion; Number of Bearings Entire Axle—9.

SPRINGS: Type—Semi-Elliptic; Material—Silico Manganese High Forging Spring Steel; Number of Leaves—Front, 10—Rear, 11; Width—Front, 3"—Rear, 3 1/2"; Length—Front, 42"—Rear, 56 1/8"; Shackles—Shackles and Bushings.

FRAME: Type—Pressed Steel Channels, Double Drop; Thickness of Material—3/16"; Maximum Depth—9 1/16"; Maximum Width Flanges—3 1/4"; Number of Outriggers—6; Number of Cross Members—7.

STEERING: Type—Worm and Sector; Ratio—Varying Ratio, 20:1; Steering Wheel—All Metal Steel Tube, 19" Diameter.

ROAD CLEARANCE: Parlor Car—Front, 8 1/2"; Rear, 8 7/8". Street Car—Front, 8 3/4"; Rear, 9 1/8".

TURNING RADIUS: Left 28' 3/4", Right 29' 1 1/2".

WHEEL BASE: 165 inches.

WHEEL TREAD: Front, 64 1/4"; Rear 66 3/4".

FUEL TANK: Location—Outside of Frame on Right Side; Material—Rust Proof Terne Plate; Capacity—40 Gallons.

BUMPERS: Street Car—Heavy-duty Spring Type Front; Parlor Car—Heavy-duty Spring Type Front and Rear.

CHASSIS LUBRICATION: Zerk High Pressure Grease Gun.

CONTROL: Brake and Gear Shift Levers—On Transmission Case; Horn Button—On Steering Wheel; Throttle, Choke and all Electric Control Switches on Instrument Board with Exception of High and Low Beam Headlamps, Switch for which is located on Left Side of Toe Board.

BODY SPECIFICATIONS

FRAMEWORK: Framework is of second growth thoroughly seasoned oak. Oak body pillars are mortised, glued and screwed to the roof rail and anchored by malleable brackets on each side. Brackets also rigidly join the carlines to the roof rail and pillars. All wooden parts are thoroughly treated with lead and oil and non-rusting screws are used throughout.

FRONT END: Front end is a steel structure consisting of structural steel angle corner pillars which are reinforced with gussets, riveted and welded, for maximum strength. A similar type steel framework supports the cowl and windshield.

SKIRTING: Skirting is reinforced with brackets bolted to the floor and pillars, and riveted to the angle iron extending entire length of body which rests on chassis outriggers.

SKID RAIL: Sides and rear of body are protected with heavy oak skid rail.

SIDE PANELS: Street Car—Heavy-gauge metal panels are installed in sections and the upper panels overlap those immediately below. Inner surface of panels are painted and interior of body lined with plywood. Parlor Car—Plymetal panels without interior lining.

ROOF: Haskelite, covered with wadding and thoroughly waterproofed duck.

FLOORING: 1 1/8" yellow pine, tongue and groove, laid crosswise and covered with 3/16" battleship linoleum.

WINDSHIELD: One piece stationary, sloping type with heavy plate glass set in Bonderized steel sash. 2-blade windshield wiper.

WINDOWS: Raised type with satin nickel finished brass sash and equipped with anti-rattlers; fixed upper transoms. Glazed with double strength glass. Window at left of driver fitted with sliding panel for signalling purposes. Rear windows are stationary and fitted with wire reinforced glass.

STEP: All metal with non-skid safety tread.

SIGNAL SYSTEM: Bell cord.

HEATING SYSTEM: Approved circulating hot air type.

LIGHTING: Exterior—2 marker lights front and rear. Interior—Street Car, 6-21 c.p. dome lights; Parlor Car, 10-15 c.p. dome lights.

ADVERTISING RACK: Street Car: Accommodating standard advertising cards located on each side and across rear above windows.

DESTINATION SIGN: Hunter roller type accommodating two lines of destination names.

GRAB RAILS: Street Car: One stanchion at left of entrance door and one behind driver's seat. Grab rails located on ceiling at each side of aisle.

BATTERY: Enclosed in wooden box located at left of driver's seat.

TOOL BOX: Street Car: Under right front longitudinal seat. Parlor Coach: Under rear seats.

REAR VIEW MIRROR: Mounted above destination sign trap door.

GENERAL DIMENSIONS:

	Street Car	Parlor Car
Overall length of body	221 1/2"	214 1/2"
Overall width	94"	85 1/4"
Inside width	87 3/4"	76"
Inside height	76"	67 3/4"
Seat spacing	30"	31"
Seat width	34"	37"
Aisle width between seat backs	22"	
Aisle width between seat cushions	18"	15"
Width of entrance in clear	27"	28"

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A DIVISION OF CHRYSLER CORPORATION

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CARNEGIE STEEL COMPANY

Subsidiary of United States Steel Corporation

PITTSBURGH U.S. STEEL PENNA.

86

J-M Brake Blocks are making unusual performance records on Bus Lines . . .

MORE than 650,000 safe, quick, quiet stops is an unbelievable record for any braking material. Yet the J-M Brake Blocks shown in the photograph below made this record in 25,000 miles of service . . . and this set of blocks is still good for thousands of miles additional cost-free braking service.

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FOR BUSES AND TRUCKS

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(As of January 1, 1931)

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			Motor	Trailer		Motor	Trailer			
New England States										
Connecticut										
Maine										
Massachusetts										
New Hampshire										
Rhode Island										
Vermont										
Eastern States										
Delaware										
District of Columbia										
Maryland										
New Jersey										
New York										
Pennsylvania										
Virginia										
West Virginia										
Central States										
Illinois										
Indiana										
Iowa										
Kentucky										
Michigan										
Minnesota										
Missouri										
Ohio										
Wisconsin										
Southern States										
Alabama										
Arkansas										
Florida										
Georgia										
Louisiana										
Mississippi										
North Carolina										
South Carolina										
Tennessee										
Western States										
Arizona										
California										
Colorado										
Idaho										
Kansas										
Montana										
Nebraska										
North Dakota										
Oklahoma										
Oregon										
South Dakota										
Texas										
Utah										
Washington										
Wyoming										
U. S. Total										
U. S. Possessions										
Canada										
Grand Total										

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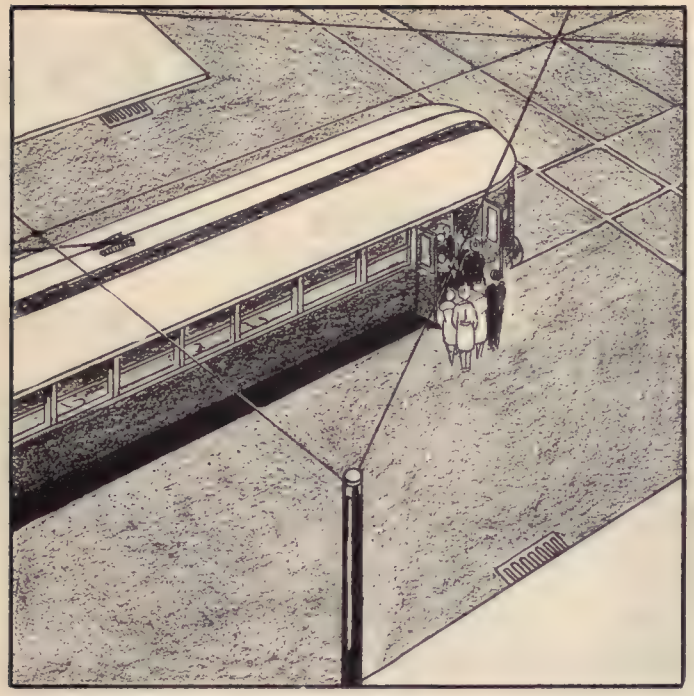


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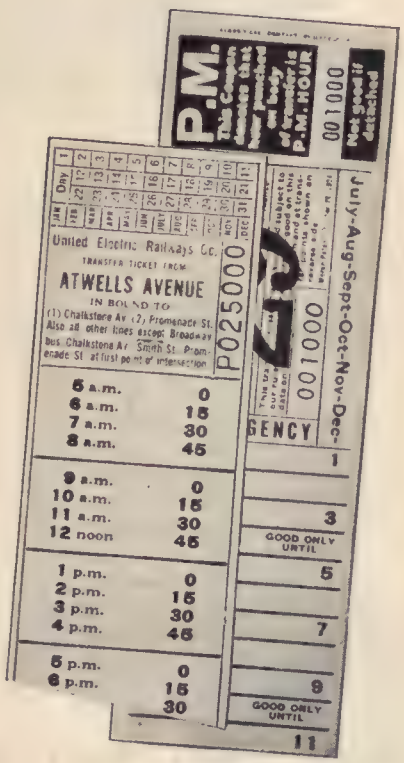
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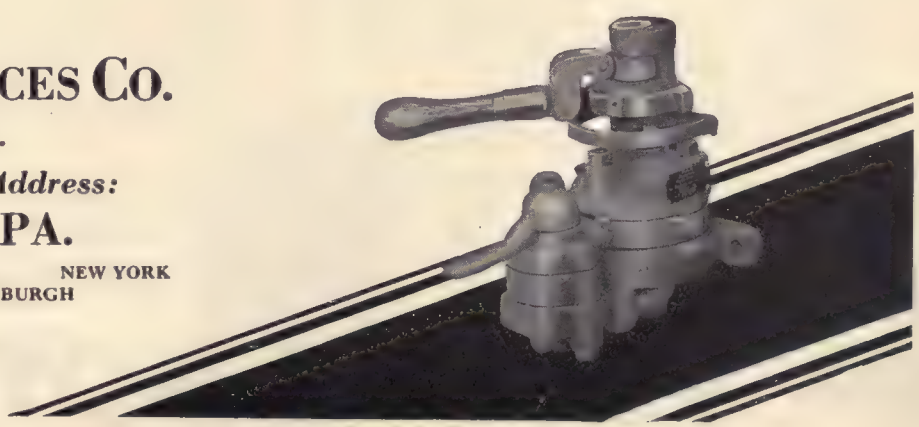
City ..... State .....

Company .....

The SAFETY CAR CONTROL EQUIPMENT

Speeds Transportation SAFELY

When conditions impel shorter headway to reduce waiting time of patrons . . . quicker brake applications to reduce stopping time . . . rapid interchange of passengers to cut down standing time . . . prompt release of brakes to permit quick get-away . . . THEN the Safety Car Control Equipment will speed up service while maintaining the basic element of safety.



SAFETY CAR DEVICES CO.
OF ST. LOUIS, MO.
Postal and Telegraphic Address:
WILMERDING, PA.
CHICAGO SAN FRANCISCO NEW YORK
WASHINGTON PITTSBURGH



A whole year's driving in less than a week!

FOR five and a half days and nights, through rain, through blistering heat, three Socony test cars—standard 1931 model sedans—raced around the torturing Indianapolis Speedway, testing the *new* Socony Motor Oil.

In less than a week, at close to a mile-a-minute pace, they covered 7,290 miles—a whole year's driving . . . the equivalent of driving uphill, throttle wide open, all the way! The test was made under the strict supervision of the American Automobile Association. The results surpassed the expectations of Socony engineers after two and a half years' work!

They already *knew* it was a great *Cold Weather Oil.* Tested at 6 below zero in an airplane flying over four and three-quarters miles high, this 100% Paraffine Base dewaxed oil flowed freely. But the Indianapolis test proved something more. It proved this *new* oil does not decompose regardless of engine heat. It proved that this *new* oil maintains the proper body at abnormally high engine temperatures, giving perfect piston seal, maximum power, and minimum fuel and oil consumption; and that the new refining process reduces to a minimum all harmful elements which cause carbon, gum and sludge.

Bus owners, too, will find that the *new* Socony Motor Oil is even better in buses than Socony "Aircraft"—in fact, the ideal lubricant. We urge you to try it today.

STANDARD OIL COMPANY OF NEW YORK

Perfected . . proved . . in every way!

new SOCONY MOTOR OIL



Length of car over buffers 40'1⅜".
Width of car at belt rail 8'3".
Height rail to step 15".
Height step to floor 13".

Floor to headlining 7'2".
Aisle width 25".
Width of seat 34".
Seat spacing 30".

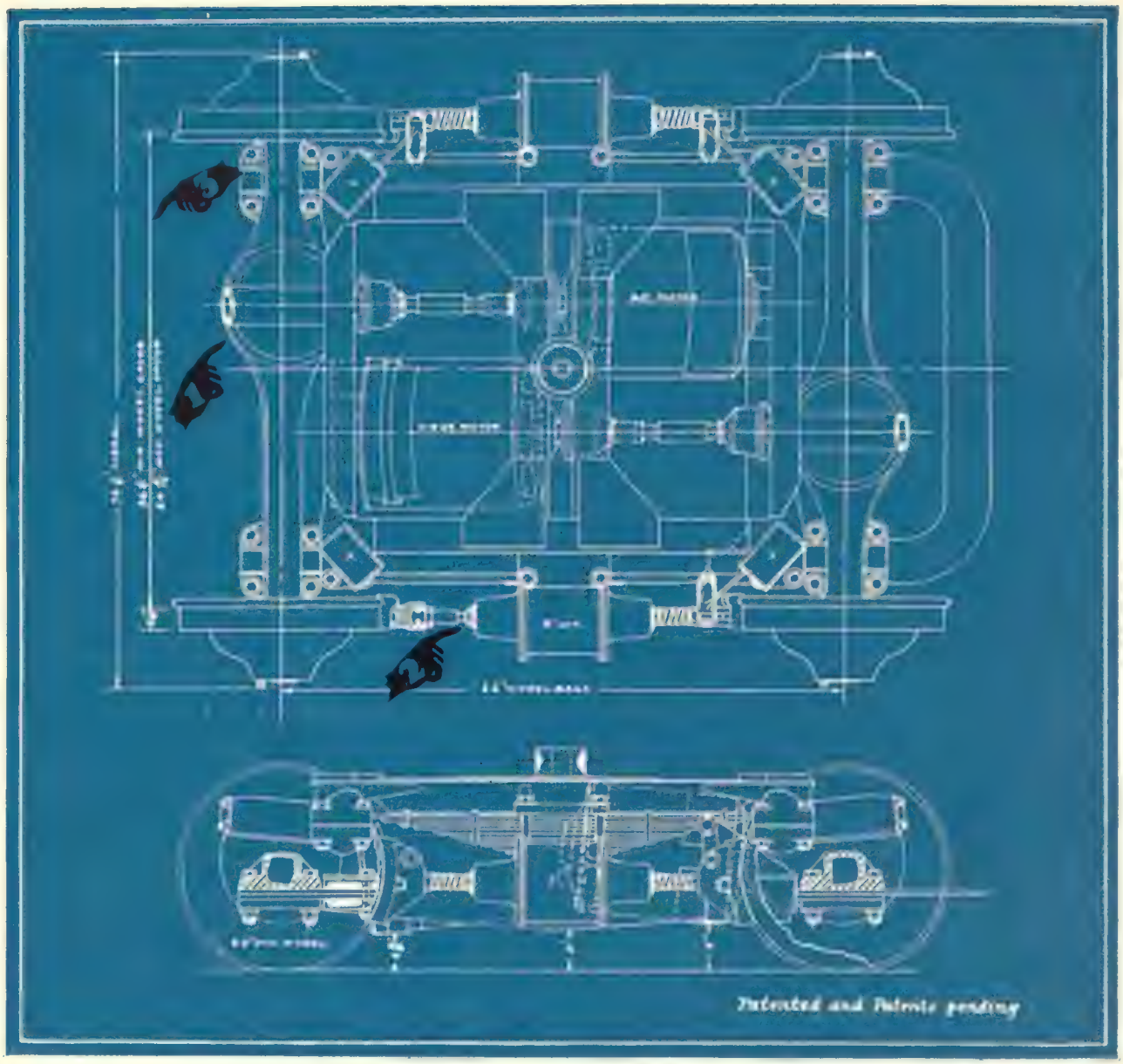
Single end car equipped with 4 motors 24,000 lb.
Double end car equipped with 4 motors 25,000 lb.

BUY EQUIPMENT

that can pay for itself out of the money it saves

THIS WILL EFFECT YOUR 1931 BUDGET

PURCHASE this new equipment and save approximately 10 per cent of the capital investment normally required for new cars and save about 17½% of your present operating expenses.



FEATURES:

1. Timken worm drive axles. Wheel diameter 24". Truck wheel base 5'6". Truck pivot centers 19'7".

2. Foot control of air brakes using cylinder on side of trucks, actuating conventional brake shoes directly on wheels. Shoes are adjusted from the outside with only two wrenches. All parts easily accessible for rapid inspection and maintenance.

3. Wheel gauge optional from 56¼" minimum to maximum of 64 5/16".

GENERAL CAR AND COACH CORPORATION
100 STATE STREET ◆ ALBANY, N. Y.

DAYTON TIES
and the
Human Equation

Complexity of installation methods is a strong point of objection to any product for any purpose.

In track work, particularly, good results depend upon the care and thoroughness of the actual work of the laborers.

Well planned methods often go wrong from laborers' carelessness.

A method which is proof against such mistakes is most desirable.

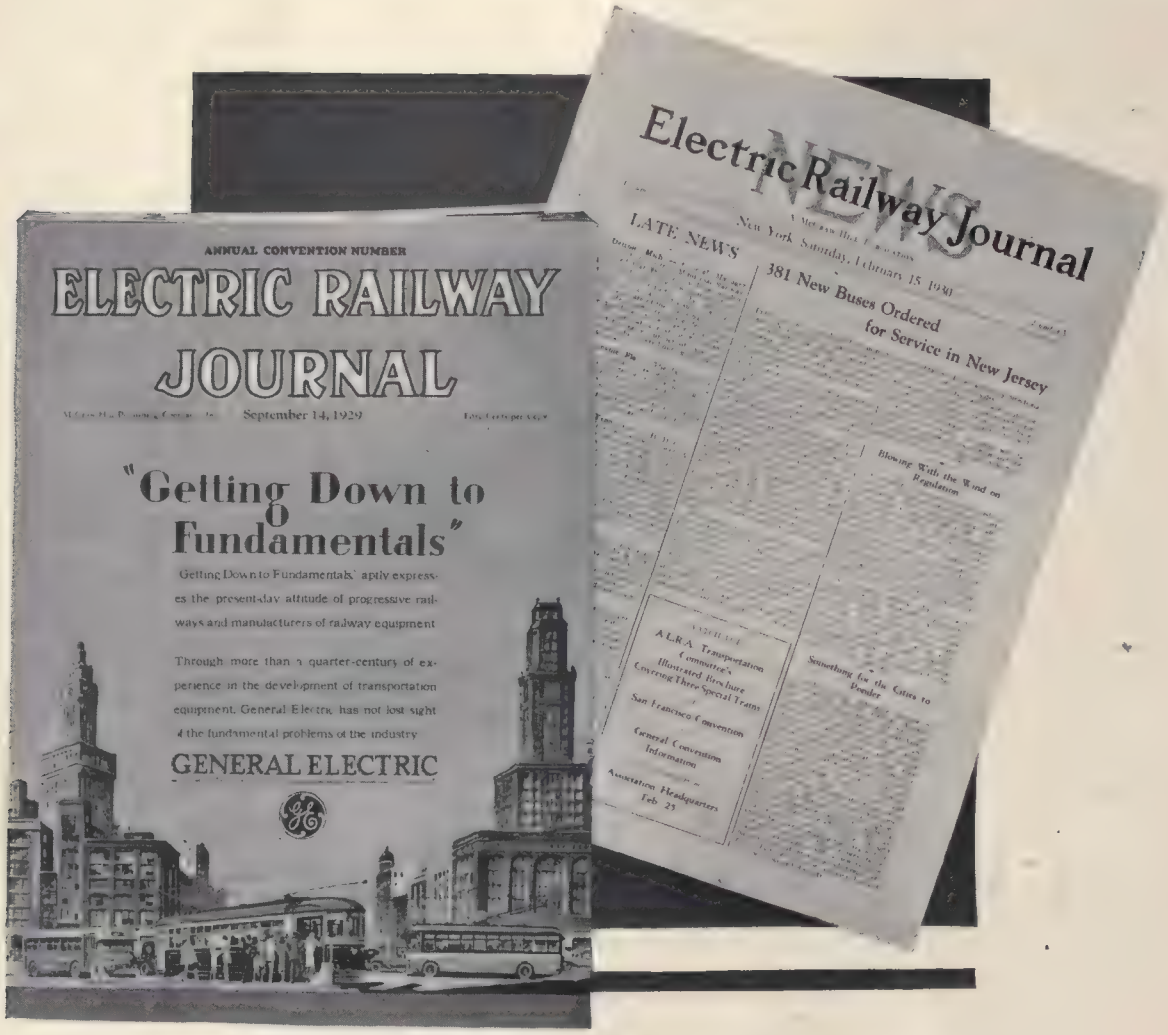
After twelve years of use and hundreds of installations of Dayton Ties, made by every known class of track laborers, the record shows not one case where the track foundation has failed or where the ties have become loose in their bed.

The simplicity and effectiveness of the Dayton method offsets the ever present human equation.

and they cost less.

❖

The Dayton Mechanical Tie Co.
Dayton, Ohio



You need *both*—
The Journal *plus* The News

THE monthly edition of *Electric Railway Journal* gives you comprehensive articles on changing trends, technical advances and broad problems facing the industry.

And the E.R.J. *News*—the newspaper of the field—presents terse, accurate news dispatches of fare changes . . court decisions . . financial and corporate notes . . new legislation . . association meetings . . personal notes . . all the vital news of the industry.

You need BOTH for a complete picture of the electric railway field. If you read only the monthly magazine, you miss the current news of the industry . . accurate, vital, fresh . . gathered by telegraph with newspaper speed. If you read only the *News*, you don't receive the benefit of the interpretive editorials, the authoritative articles, the maintenance and operating data of the *Electric Railway Journal* monthly magazine.

Subscription price of the E.R.J. *News* is low—only $2 for the complete year's service of thirty-nine issues (it appears on thirty-nine Saturdays during the year). Foreign rate, $4 a year. Sold in combination with the monthly edition of *Electric Railway Journal* for $5 a year domestic and $9 foreign.

Send no money now. Simply fill out the coupon below—and mail it today! Give yourself a bird's-eye view of the entire electric railway field.

Just tear off, fill in and mail this coupon today!

ELECTRIC RAILWAY JOURNAL
10th Ave. at 36th St., New York

Check one:

☐ Enter my subscription to the Electric Railway Journal NEWS and send me a bill for $2. (Foreign rate: $4 year).

☐ Enter my subscription to both the Electric Railway Journal monthly magazine and the separate NEWS service. Bill me for $5.



IT ISN'T ALL FUN FOR A TROLLEY WHEEL

IT'S easy for any trolley wheel to run smoothly and provide ample conductivity in balmy weather.

But when rain, snow, and sleet whip trolley wires, it isn't fun for trolley wheels.

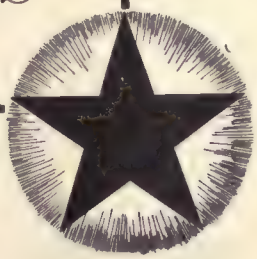
That's where Kalamazoo Trolley Wheels prove their value. Ample conductivity is always present for those who standardize on Kalamazoo Trolley Wheels.

It is significant that many Electric Railway Companies use them as a basis for comparison.

Write for details and bulletins.

THE STAR BRASS WORKS

KALAMAZOO, MICHIGAN



KALAMAZOO

Centralize Traffic Control







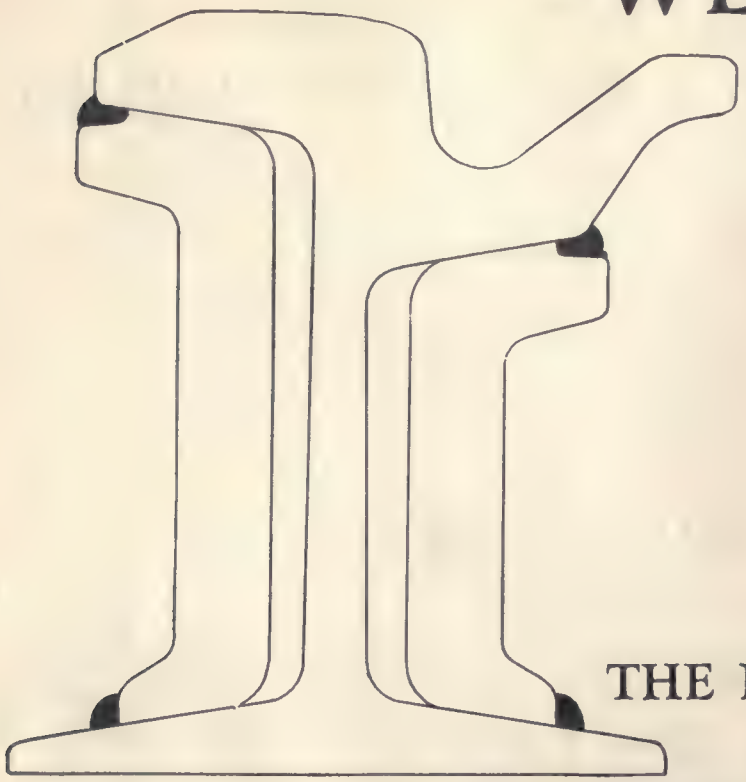
THE control of all traffic over a busy line, whether the line is a mile long or thirty or forty, can be centralized into the hands of one operator. All information necessary for the manipulation of the levers is brought to him in the most accurate manner.

Centralized Traffic Control is adaptable to a complex urban traffic system or to a long interurban line. It carries a maximum number of controls and indications over a minimum number of line wires. Such control is proving to be a great time saver and economy producer on more than 80 installations.

1881 Union Switch & Signal Co. 1930

SWISSVALE, PA.

"WELD PLATES"



For EFFICIENT, ECONOMICAL

JOINTS

Do you believe in statistics? Rely on performance records? If so, the performance records of the many "Weld Plates" now in use will convince you that they lead the bar-weld joints in efficiency and economy.

"Weld Plates" represent the most modern welding practice. They are the strongest and most up-to-date plates rolled especially for electric welded joints. Note the shape—the grooves for retaining plenty of weld metal along the upper edges—the wide contact areas at top and bottom—the suitability for the use of short bolts.

A trial will convince you of their efficiency and economy.

THE RAIL JOINT COMPANY

165 Broadway, New York



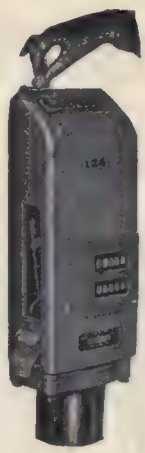
Roebling
Electrical Wires & Cables

Quality Products

From the finest Magnet Wire to Largest Power Cables.



John A. Roebling's Sons Company, Trenton, N. J., Makers of Wire Rope and Wire



JOHNSON FARE COLLECTING SYSTEMS

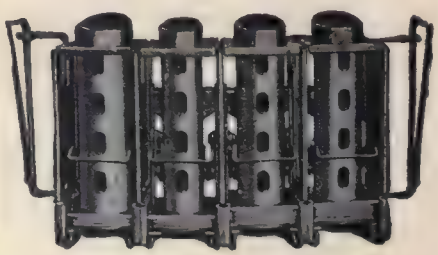


Johnson Electric Fare Boxes and overhead registers make possible the instantaneous registering and counting of every fare. Revenues are increased 1½ to 5% and the efficiency of one-man operation is materially increased. Quicker boarding of passengers with resultant reduction in running time for the buses. Over 5000 already in use.

When more than three coins are used as fare, the Type D Johnson Fare Box is the best manually operated registration system. Over 50,000 in use.

Johnson Change-Makers are designed to function with odd fare and metal tickets selling at fractional rates. It is possible to use each barrel separately or in groups to meet local conditions. Each barrel can be adjusted to eject from one to five coins or one to six tokens.





Johnson Fare Box Co.

4619 Ravenswood Ave., Chicago, Ill.

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a comprehensive treatment of the business and economic problems of public utilities



This book presents the essential facts and the most mature view upon the underlying financial and economic phases of public utility companies, with particular emphasis on electric railways, electric light and power companies and gas companies.

Economics of Public Utilities

By L. R. NASH

Public Utility Engineer, Stone and Webster, Inc.

413 pages, 6x9, $4.00

This book discusses every angle of the public utility as a business and treats thoroughly such subjects as capitalization, investment features, franchises, regulation, valuation, depreciation, taxes, rates, service, accounting methods, public relations, etc.

Mr. Nash has drawn from his experience of more than twenty-five years in the business of designing, constructing and managing public utility properties for the data on which this book is based. The comprehensive view it offers of the business and economic phases of public utility enterprises will be of value to utility officials, bankers, investors, engineers, lawyers, accountants, public officials and the economist and business man.

CONTENTS:

1.—Origin and Development of Public Utilities. 2.—Distinguishing Characteristics of Public Utilities. 3.—Franchises. 4.—Capitalization. 5.—Accounting Methods. 6.—Regulation. 7.—Valuation. 8.—Depreciation. 9.—Rate of Return to Investors. 10.—Rate Structures. 11.—Taxation. 12.—Tests of Utility Securities as Investments. 13.—Tests of Utility Development. 14.—Public Ownership. 15.—Public Relations. 16.—Some Current Utility Problems. 17.—Views on Outstanding Issues.

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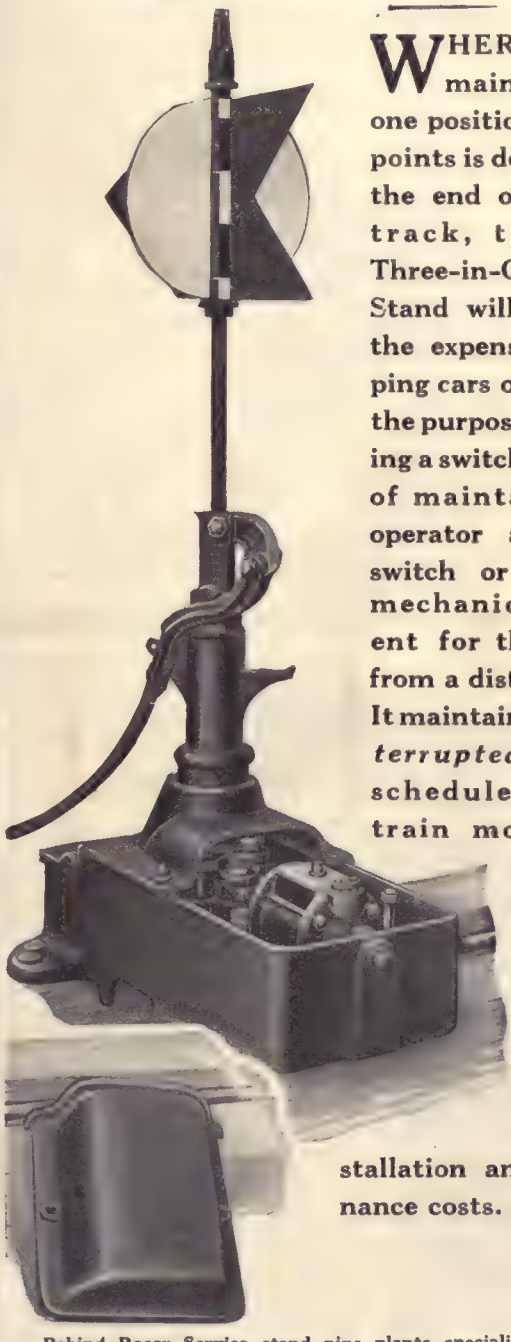
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FOR THE ACCOMPLISHMENT OF ECONOMY WITH SAFETY .....

The New Racor Three-in-One Switch Stand



WHEREVER the maintenance of one position of switch points is desired, as at the end of a double track, the Racor Three-in-One Switch Stand will eliminate the expense of stopping cars or trains for the purpose of throwing a switch or the cost of maintaining an operator at such a switch or expensive mechanical equipment for throwing it from a distant tower. It maintains an *uninterrupted* routine schedule of car or train movements; safeguards equipment at these locations and promotes economies in lowered installation and maintenance costs.

Behind Racor Service stand nine plants specializing in the manufacture and distribution of railroad track turnout and crossing equipment, including Manganese Work for heavy traffic.

RAMAPO AJAX CORPORATION

RACOR PACIFIC FROG AND SWITCH COMPANY, Los Angeles · Seattle
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General Offices — 230 PARK AVENUE, NEW YORK
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Nine Racor Works
Hillburn, New York. Niagara Falls, N.Y. Chicago, Illinois. East St. Louis, Ill.
Superior, Wis. Pueblo, Col. Los Angeles, Cal. Seattle, Wash. Niagara Falls, Ont.

REFLEX Signs and Symbols

Optical construction permits 75% of the light striking the lens being returned to source from whence it came in sharp distinct outline.

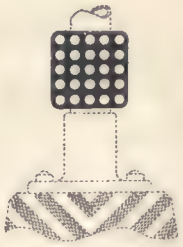
Clearly visible by day and gleaming at night as though illuminated by electricity. Command instant attention of enginemen or motorists.

Durable, non-shattering, made of solid glass.

Constructed and assembled of individual lens mounted in aluminum casting and allowing easy replacement.

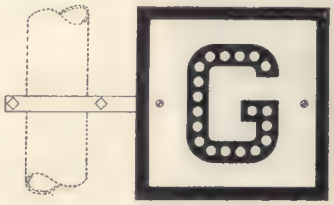
Hermetically sealed units giving lasting efficiency.

Bulletin 23 fully describes. Ask for your copy.



W-17A WARNING UNIT

The unit consists of 25 No. 1 lens mounted in aluminum casting and for use in center of streets, crossing signals, gates and miscellaneous obstructions.



L-5 GRADE SIGNAL

A 10 in. aluminum "G" casting studded with 19 No. 1 lens and mounted on a 16 in. square 12 gauge steel plate.



W-101 R. R. WARNING SIGN

Two 6 in. aluminum letters studded with 14 No. 1 lens each and mounted on a standard single track sign.



NIGHT INDICATION

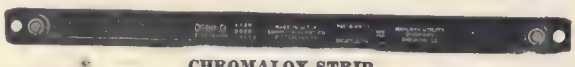
Showing how car headlights will illuminate the L-5 signal at night.

Louisville Frog, Switch & Signal Co.

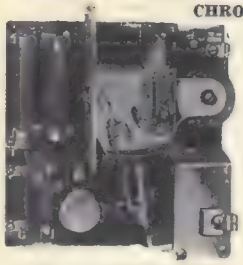
LOUISVILLE, KENTUCKY

Utility Car Heaters fitted with

ENCLOSED HEATING elements carry the Underwriters' Laboratories Label. They give 100% energy output for what you put in.



CHROMALOX STRIP



NO. 10 REGULATOR

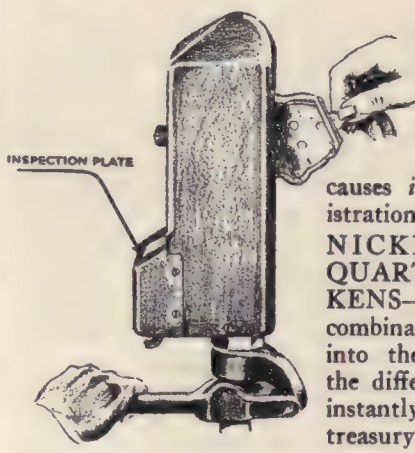
UTILITY HEAT REGULATORS economize in current consumption.

UTILITY HONEYCOMB VENTILATORS keep the air pure and wholesome.

Car Comfort with Utility Heaters Regulators Ventilators

RAILWAY UTILITY COMPANY
2241-47 Indiana Ave., Chicago
J. H. DENTON, *Eastern Mgr.*
1328 Broadway, New York

Fare Collection,

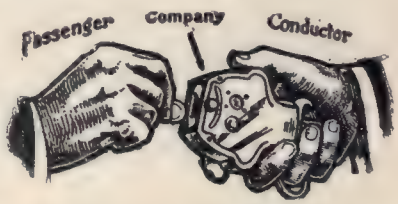


to avoid the old temptations and leaks, *necessitates the coin-slot mechanism.*

Coin - insertion causes *instantaneous* registration *by the patrons.* NICKELS, DIMES, QUARTERS or TOKENS—all or in various combinations, are paid into the *one* coin-slot—the different values being instantly assured your treasury.

MONEY METERS are furnished in either *portable* or *stationary* form and are mechanically unbeatable for trolleys and buses.

This *at-the-source* protection will probably add 4% to 10% to your present passenger income.



Money-Meters, Inc. (Successor to Rooke Automatic Register Co.)
3209 Book Tower, Detroit, Mich.

OKOCORD



MAKES IDEAL MOTOR LEADS

TOUGH, KINK-PROOF, WATERPROOF oil, acid, alkali resistant and very flexible...these properties make OKOCORD ideal for motor leads.

For this purpose, OKOCORD is made with extra flexible conductors, each wire being carefully tinned. The whole conductor is then wrapped with a paper separator to keep the rubber away from it, which facilitates skinning and soldering. The tough, tread-rubber sheath insulates and protects the conductor from all external damage.

If you haven't used it for this purpose, send for a trial order and learn for yourself how economical it is.

OKONITE PRODUCTS

Okonite Insulated Wires and Cables

Varnished Cambric Cables

Okonite Insulating Tape

Manson & Dundee Friction Tapes

Okocord

Okoloom

OKONITE-CALLENDER PRODUCTS

Impregnated Paper Cables

Super-tension Cables

Splicing Materials

THE OKONITE COMPANY

Founded 1878

THE OKONITE-CALLENDER CABLE COMPANY, INC.

Factories: Passaic, N. J. Paterson, N. J.

SALES OFFICES:

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"NATIONAL PRODUCTS"

give you the kind of service that means true operating economy

The Vigne

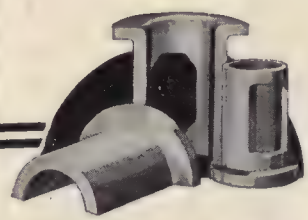


Bimetallic Armature Bearing

Our engineering department, because of its experience, can be of real benefit to you. Prices and full details will be submitted upon request.



"Armature" Babbitt Metal



"Tiger" Bronze Axle and Armature Bearings



"More-Jones" Trolley Wheels and Harps

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Just Seven Months Ago



SEND FOR YOUR COPY OF BULLETIN No. G-830

In the short time since then the many outstanding features of this new line have been recognized and appreciated by many very particular engineers and large numbers of R-S Graphics are giving fine service under all sorts of trying conditions.

The line comprises switchboard, portable and wall models, A.C. and D.C., ammeters, voltmeters, wattmeters, power-factor meters and special devices for special applications.

Forty years' experience is back of

ROLLER-SMITH COMPANY

Electrical Measuring and Protective Apparatus

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TUCOLITH

FLEXOLITH

Long Wearing

Even the rough brogans of stamping workmen do not injure the hard, tough surface of Tucolith floors.

6 REASONS WHY

Tucolith is the popular flooring material for cars and busses.

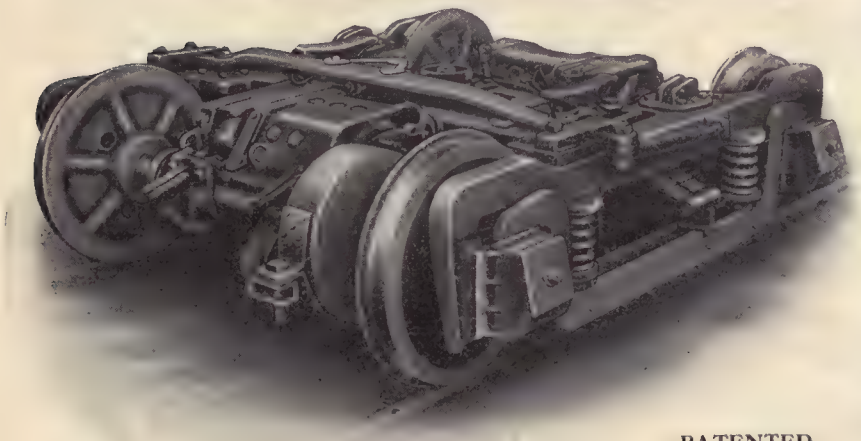
1. Long Life
2. Attractive
3. Non-Slip Surface
4. Fireproof
5. Sound Deadence
6. Sanitary

TUCO PRODUCTS CORP.
30 CHURCH ST., NEW YORK
PEOPLES GAS BLDG.,
122 S. MICHIGAN AVE., CHICAGO

COMMONWEALTH TRUCKS

"SWING MOTION TYPE"

The end of every year shows lowered operating Costs with these Trucks



PATENTED

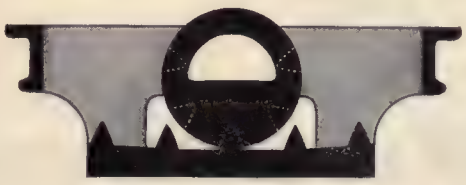
They are therefore worth investigating now. Learn about their features and how they will save money for you on repairs and costly maintenance. Here is one feature—the cast steel frame including cross transoms and pedestals is one strong unit.

General Steel Castings Corp.

Eddystone Penna. Granite City Illinois

STUCKI SIDE BEARINGS

SPECIAL CARBON STEEL
HEAT TREATED



LARGE WEAR SURFACES
FREE ROLLER
ONLY TWO PARTS

A. STUCKI CO.
OLIVER BLDG., PITTSBURGH, PA.

Canadian Representative
The Holden Co., Ltd., Montreal, Canada



Right on top of this maintenance problem

DIXON'S Bright Aluminum Paint

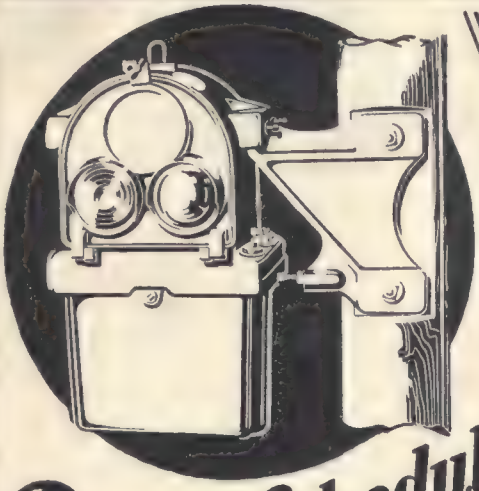
. . . for car roofs

Electric railway operators using DIXON'S Bright Aluminum Paint have been able to cut down one big item of excessive maintenance. And they have transferred a maintenance overhead to the revenue-building side of their ledgers. They are painting car roofs with Bright Aluminum.

Here is two-fold value in a single investment—the tremendous durability of the straight aluminum pigment in a tough vehicle of spar varnish which insures long service life and low cost per year of service—and the enduringly bright, non-discoloring appearance which attracts patronage.

Try it the next time your cars go in the shop for repainting. You can brush it or spray it on, easily, quickly.

JOSEPH DIXON CRUCIBLE CO.
Est. 1827
Jersey City New Jersey



Faster Schedules

Nachod Automatic Block Signals, operating independently of the train crew, insure safe, fast operation and eliminate vexatious delays at switches. They take chance and memory out of the picture . . . provide maximum safety under all conditions of operation. Block and Highway Crossing Signals, Headway Recorders. Nachod & U. S. Signal Co., Inc., Louisville, Ky.

"Nachod Spells Safety"

NACHOD SIGNALS

PANTASOTE

TRADE MARK

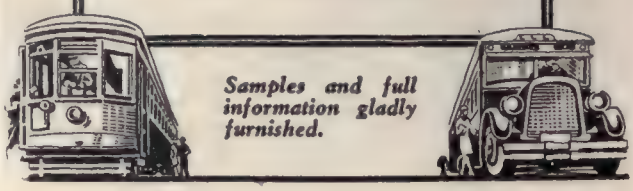
—the car curtain and upholstery material that pays back its cost by many added years of service. Since 1897 there has been no substitute for Pantasote.

AGASOTE

TRADE MARK

—the only panel board made in one piece. It is homogeneous and waterproof. Will not separate, warp or blister.

Standard for electric railway cars and motor buses



Samples and full information gladly furnished.

The PANTASOTE COMPANY, Inc.
250 Park Avenue NEW YORK

January Annual Statistical and Progress Number Closes December 22nd

Early receipt of copy and plates will enable us to serve you best—to furnish proofs in ample time so changes or corrections may be made if desired.

Electric Railway Journal.

New mechanical features guard against leaks



The R-13 INTERNATIONAL BUS REGISTER

Will increase your fare collections 2 to 5%. Accept our free trial offer and make these savings for yourself. Write for details.

THE INTERNATIONAL REGISTER COMPANY
17 South Throop Street, Chicago

A maintenance plan is for the "long run" Boyerized Parts fit!





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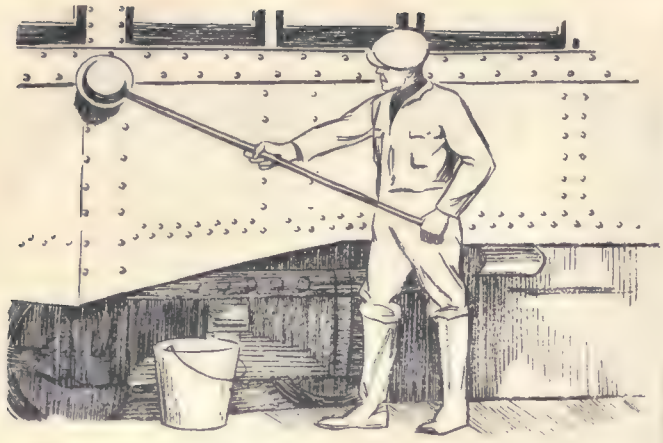
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ALPHABETICAL INDEX

This index is published as a convenience to the reader. Every care is taken to make it accurate, but *Electric Railway Journal* assumes no responsibility for errors or omissions.

Allied Engineers 80
Aluminum Co. of America ..... Insert 57-58
American Brake Shoe & Foundry Co 83
American Bridge Co 76
American Car Co ..... Third Cover
American Steel Foundries 38-39
American Steel & Wire Co 44
American Tel. & Tel. Co 41

Beeler Organization 80
Bemis Car Truck Co 79
Bender Body Co., The 84
Bethlehem Steel Co 59
Bibbins, J. Roland 80
Brill Co., The J. G ..... Third Cover
Buchanan & Layng Corp 80
Byllesby Eng. & Manag. Corp 80

Carnegie Steel Co 52
Cities Service Co 36-37
Collier, Inc., Barron G 29
Consolidated Car Heating Co 31

Dayton Mechanical Tie Co., The 69
De Vilbiss Co., The 56
Dixon Crucible Co., Joseph 77

Electric Service Supplies Co 5

Fargo Motors Corp ..... Insert 45-48
Ford, Bacon & Davis 80

General Car & Coach Corp ..... Insert 67-68
General Electric Co 16-17-18
General Leather Co 79
General Motors Truck Co ..... Insert 25-28
General Steel Castings Co 77
Globe Ticket Co 61
Goodrich Rubber Co., The B. F 55
Goodyear Tire & Rubber Co 20-21

Hale-Kilburn Co 12
Hemingray Glass Co 79
Hemphill & Wells 80
Heywood-Wakefield Co 23

Illinois Steel Co 32
International Motor Co ..... Back Cover
International Register Co., The 78
International Steel Tie Co 22

Jackson Lumber Co 49
Jackson, Walter 80
Johns-Manville Corp 53
Johnson Fare Box Co 72

Kelker, Jr., R. F 80
Kuhlman Car Co ..... Third Cover

Long Mfg. Co. ... 60
Lorain Steel Co. ... 11
Louisville Frog, Switch & Signal Co. ... 74

Mack Trucks, Inc. ... Back Cover
McGraw-Hill Book Co., Inc. ... 73
Metal & Thermit Corp. ... 14-15
Mica Insulator Corp. ... 40
Miller Trolley Shoe Co. ... 50
Money-Meters, Inc. ... 74

Nachod and U. S. Signal Co. ... 78
National Bearing Metals Corp. ... 75
National Brake Co., Inc. ... 19
National Carbon Co. ... 30
National Tube Co. ... 51

Oakite Products, Inc. ... 82
Ohio Brass Co. ... 8-9
Okonite Co., The ... 75
Okonite-Callender Cable Co., The ... 75

Pantasote Co., Inc., The ... 78

Rail Joint Co., The ... 72
Railway Track-work Co. ... 6-7
Railway Utility Co. ... 74
Ramapo Ajax Corp. ... 73
Richey, Albert ... 80
Roebling's Sons Co., John A. ... 72
Roller-Smith Co. ... 76

Safety Car Devices Co. ... 65
Sanderson & Porter ... 80
Searchlight Section ... 81
Standard Oil Co. (Indiana) ... 33
Standard Oil Co. of New York ... 66
Standard Steel Works Co. ... 63
Star Brass Works, The ... 71
Stoody Co. ... 13
Stucki Co., A. ... 77

Timken-Detroit Axle Co. ... 34-35
Timken Roller Bearing Co. ... Front Cover
Tuco Products Corp. ... 76

Union Metal Mfg. Co., The ... 24
Union Switch & Signal Co. ... 71

Wason Mfg. Corp. ... Third Cover
Westinghouse Elec. & Mfg. Co. ... Second Cover, 4
Westinghouse Traction Brake Co. ... 10
Wish Service, The P. Edw. ... 80

Yellow Coach ... Insert 25-28

Searchlight Section — *Classified Advertising*

EQUIPMENT (Used, etc.)
Crawbuck Co., John D. ... 81
Duie Pyle Contr. Co., A. ... 81
Perry, Buxton, Doane Co., The ... 81
Schiavone, L. & Bonomo Bros., Inc. ... 81
Zelnicker in St. Louis ... 81
POSITIONS VACANT AND WANTED ... 81



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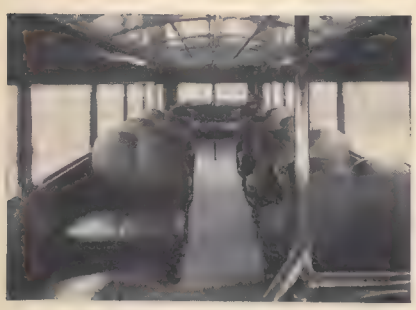






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Completely MACK-Built Body and Chassis

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